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VOLUME XXVIII 1962.

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THE CORRECT NAMING OF ONE OF THE RARER DWARF PROTEAS IN THE SOUTH-WESTERN CAPE

H. B. Rycroft

(*National Botanic Gardens of South Africa, Kirstenbosch*)

ABSTRACT

The Protea hitherto known as *P. echinulata* Meisner and described in 1856 was earlier described by Salisbury in Knight's Proteeae of 1809 as *Erodendrum restionifolium*. Under International Rules the earliest name for the species must be retained and the species is therefore to be known as *P. restionifolia* (Salisb. ex Knight) Rycroft.

When Salisbury (in Knight, Prot. 1809) described *Erodendrum restionifolium* he stated that it was "a rare species discovered by Mr. J. Niven on dry barren mountains at Brandfly". The holotype is at Kew and the label is entered as "Niven No. 32 acaulis plant—dry barren alpine places Brandfly". Added on the label in Salisbury's (?) hand is "Restionifolium".

"Brandfly" is obviously Brandvlei near Worcester where, in fact, specimens which match the type have been collected on various occasions.

It appears that Meisner could not have seen Niven's specimen because in 1856 he described the same species as *P. echinulata* and cited Zeyher's 3670 and "Ludwig in herb. Mus. Stuttgart" as his types. These specimens were collected in the Caledon area.

On herbarium sheets the species has been given various names. For instance Burchell (7913) called it "*P. scabra* var *angustifolia*" and also (7160) "*P. graminea*". Guthrie called it "*P. tenuifolia* R.Br." which in fact it does resemble in some respects. Meisner noted the similarity when he stated "Forte P. tenuifoliae var. ? attamen foliis tenuioribus, egregie echinulatis, capitulo non hemispherico, floribus longioribus," etc.

In 1912 Phillips described *P. echinulata* Meisn. var *minor*, based on Schlechter 10215, collected in the Cold Bokkeveld. It is true that this specimen has a head which is smaller than Niven 32 and Zeyher 3690, but intermediate forms have since been collected and the variety cannot be upheld.

SYNONYMY

PROTEA RESTIONIFOLIA (*Salisb. ex Knight*) *Rycroft* comb. nov.
Erodendrum restionifolium *Salisb. ex Knight* Prot. 45 (1809)
Protea echinulata *Meisn.* in D C. Prodr. xiv 242 (1856); *Phill. et Stapf,* in Dyer Fl. Cap. v, i, 600 (1912).
P. echinulata var **minor** *Phill.* in Dyer Fl. Cap. v, i, 600 (1912)

The holotype is Niven 32 in herb. Kew.

DISTRIBUTION

P. **restionifolia** (Salisb. ex Knight) Rycroft.

CERES: Kleinvlei, Cold Bokkeveld, *Schlechter* 10215 (B, BM, BOL. K, PRE).

WORCESTER: Brandvlei, *Niven* 32 (K, holo.), *Compton* 8839 (NBG), *Rycroft* 2188 (NBG), Doorn River Valley, *Leipoldt in herb. Bol.* 19261 (BOL), Scherpenheuwel, *Barker* 7524 (NBG), Foothills of farm Pokkraal, *van Breda* 364 (K, PRE).

CALEDON: between Genadendal and Donkerhoek, *Burchell* 7913 "*P. scabra var angustifolia*" (K), sandy soil between Houwhoek and Bot River, *Bowie* (K), Caledon, *Guthrie* "*P. tenuifolia* R.Br." (K, PRE), Kleinrivierberg, *Zeyher* 3670 (K, P), Hermanus Mts., *Marloth* 6229 (PRE), Bot River, *Guthrie in herb SAM* 54256 (SAM), *Guthrie* 431 (BOL), Villiersdorp, *de Villiers* (BOL).

RIVERSDALE: Garcias Pass, *Burchell* 7160 "*P. graminea*" (K).

WITHOUT LOCALITY: *Bowie* (BM), *Drege* 3670 (*Zeyher collection?*) (EI), *Zeyher* 3670 (G, P).

THE LUKANGA SWAMPS—NORTHERN RHODESIA

S. C. SEAGRIEF

(*Botany Department, Rhodes University*)

(With Plates I and II).

ABSTRACT

To the west of Broken Hill, N.R., lie the Lukanga Swamps, which occupy an area of approximately 1,000 square miles. The vegetation of the swamps is characteristically zoned according to the depth of the water. In shallow water *Leersia hexandra* is dominant. It is followed successively with increasing depth by *Eleocharis* sp., *Typha* sp., and *Phragmites communis*. *Nymphaea* spp. are generally distributed in all zones. Floating mats of vegetation are of irregular occurrence.

There is some indication that there has been a permanent rise in the water level of the swamps as semi-submerged termite mounds were observed quite far out from the shore at the end of the dry season of 1958.

INTRODUCTION

My reason for going to the Lukanga Swamps in August 1958 was to collect samples for pollen analysis from the basal sediments of open water stretches in the swamps. It is well known that if a suitable surface, such as a growing peat bog or a lake sediment, is available, pollen grains will become incorporated in the deposit as it develops over the years. Thus, in the course of time, a record of the past history of the surrounding vegetation will be preserved in the deposit. Although it was found that the samples contained too few pollen grains for an interpretation of past history to be attempted, it may be of interest to record the general ecological features of the area.

GENERAL ECOLOGY

The Lukanga Swamps lie roughly 40 miles to the west of Broken Hill, Northern Rhodesia. As access to them is difficult I was fortunate in joining an outward bound excursion organised by the Rural District Commissioner for schoolboys from Broken Hill. The swamps occupy an area of approximately 1,000 square miles of a flood plain bounded on the north-western margin by the Kafue River. Their chief water supply comes from the Lukanga River, which flows into the swamps in the north-eastern corner and then out again in the north-western corner where it joins the Kafue River (see Map). In times of high flood the Kafue River overflows into the swamps by way of channels and "dambos" (equivalent to the South African vleis) and may reverse the flow of the Lukanga River. A further supply of water is derived from small rivers and dambos draining the wooded plateau to the east of the swamps (Macrae, 1934). Little seems to be known about the southern and western margins of the swamps.

At intervals the swamps are broken by expanses of open water. Only one of these, called Chilondo by the Africans, could be investigated during the short visit. It lies approximately 3 miles west of Waya village, which is situated on the eastern margin of the swamps.

Observations on changes in species composition and records of depths of water were made from the bank to Chilondo. It was clear that the distribution of the rooted plant communities was closely linked with depth of the water. Four distinct zones could be recognized over this stretch of swamp. In the wide marginal zone of shallow water a grass, *Leersia hexandra* was dominant. With it occurred occasional clumps of *Cyperus articulatus* and *Phragmites communis*. Wherever pools were present they were colonised by *Nymphaea coerulea*, *Nymphaea capensis* and the submerged aquatics *Ceratophyllum demersum* and *Utricularia*. Channels cut by the African fishermen soon become choked by these species if they are not used frequently.

It was of great interest to find semi-submerged termite mounds up to ½ mile out in the *Leersia* zone. (Plate I, Fig. 1). As termite mounds can only be built on dry land it seems likely that a permanent rise in the water level of the swamps has occurred since the mounds were constructed. There do not appear to be any records of seasonal variations of water level for the swamps. It was apparent from high water marks on the stems of *Phragmites* that a drop in level of two feet had occurred since the previous rainy season. It seems unlikely, even after periods of drought and consequent lower water levels, that the land surface would be exposed for long enough for large termite mounds to be built.

At depths of over four feet (August 1958 level) *Leersia* is replaced by *Eleocharis sp.* (Plate I, Fig. 2). *Eleocharis sp.* has very characteristic dark green terete stems projecting up to three feet above the surface of the water. The only other conspicuous species in the *Eleocharis* zone is *Nymphaea*, although scattered clumps of *Phragmites* and *Typha* occur. At depths greater than seven feet *Typha* sp. become dominant (Plate II, Fig. 1). In some parts it forms pure stands, apart from the everpresent waterlilies

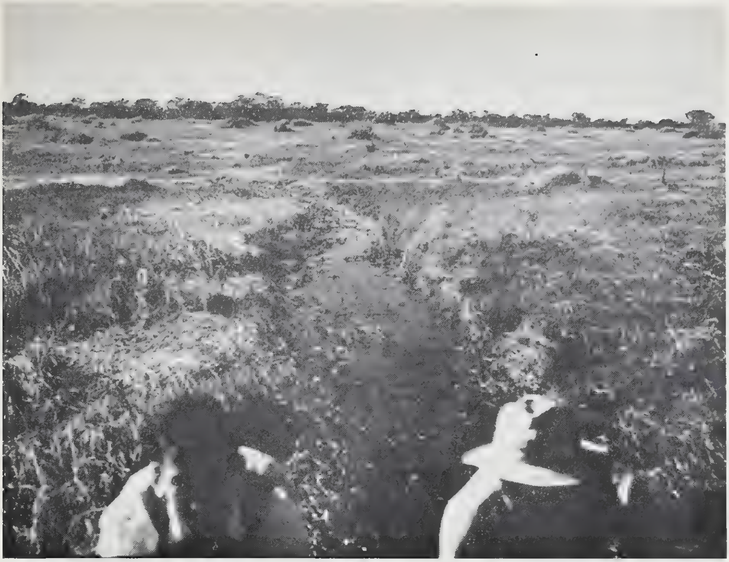


Fig. 1.—*Leersia hexandra* zone with semi-submerged termite mounds. The channel is kept open by the frequent passage of dugouts to and from the fishing localities.

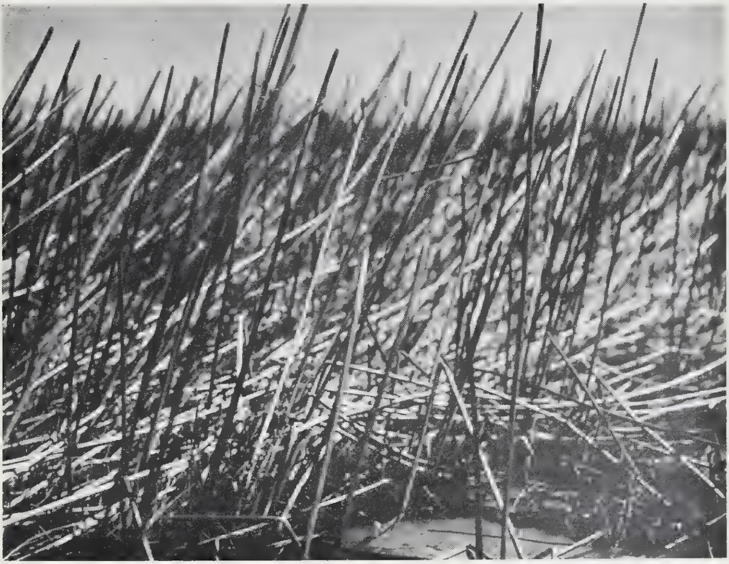


Fig. 2.—*Eleocharis sp.* zone showing the very characteristic green stems protruding up to 3 ft. above water level and leaves of *Nymphaea* sp. in right foreground.

Plate I.

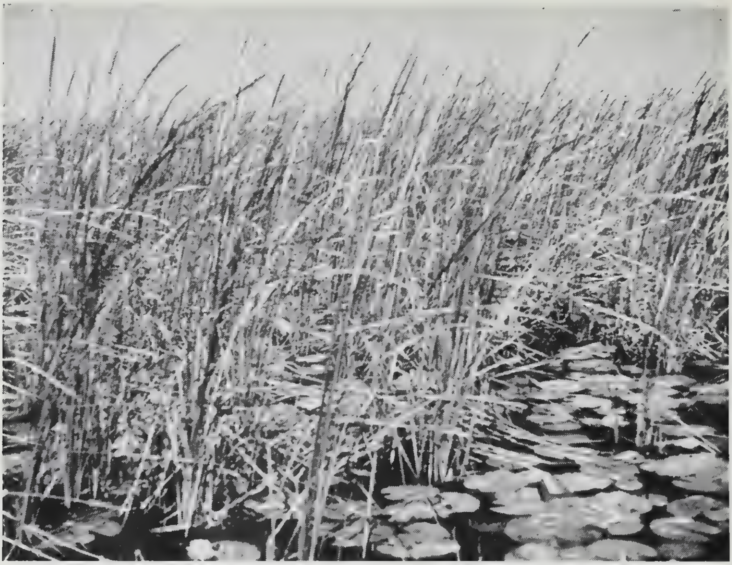


Fig. 1. *Typha* zone. A tall stand of *Typha* sp. with some *Nymphaea* sp.

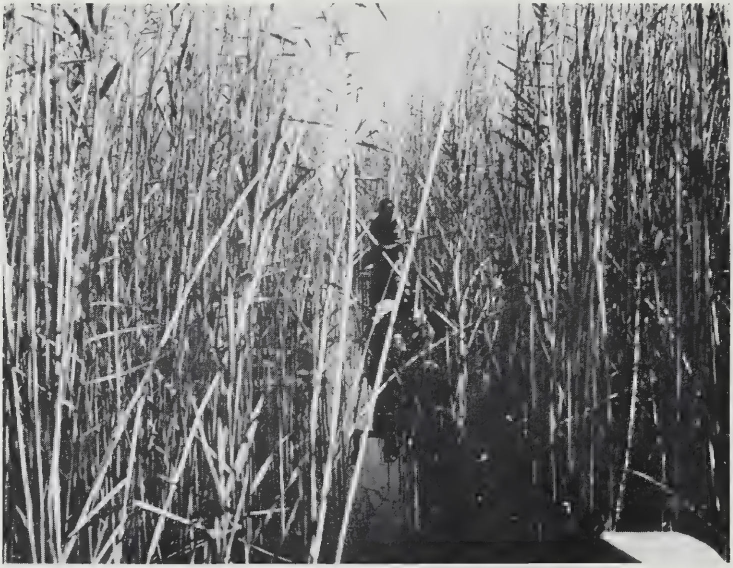
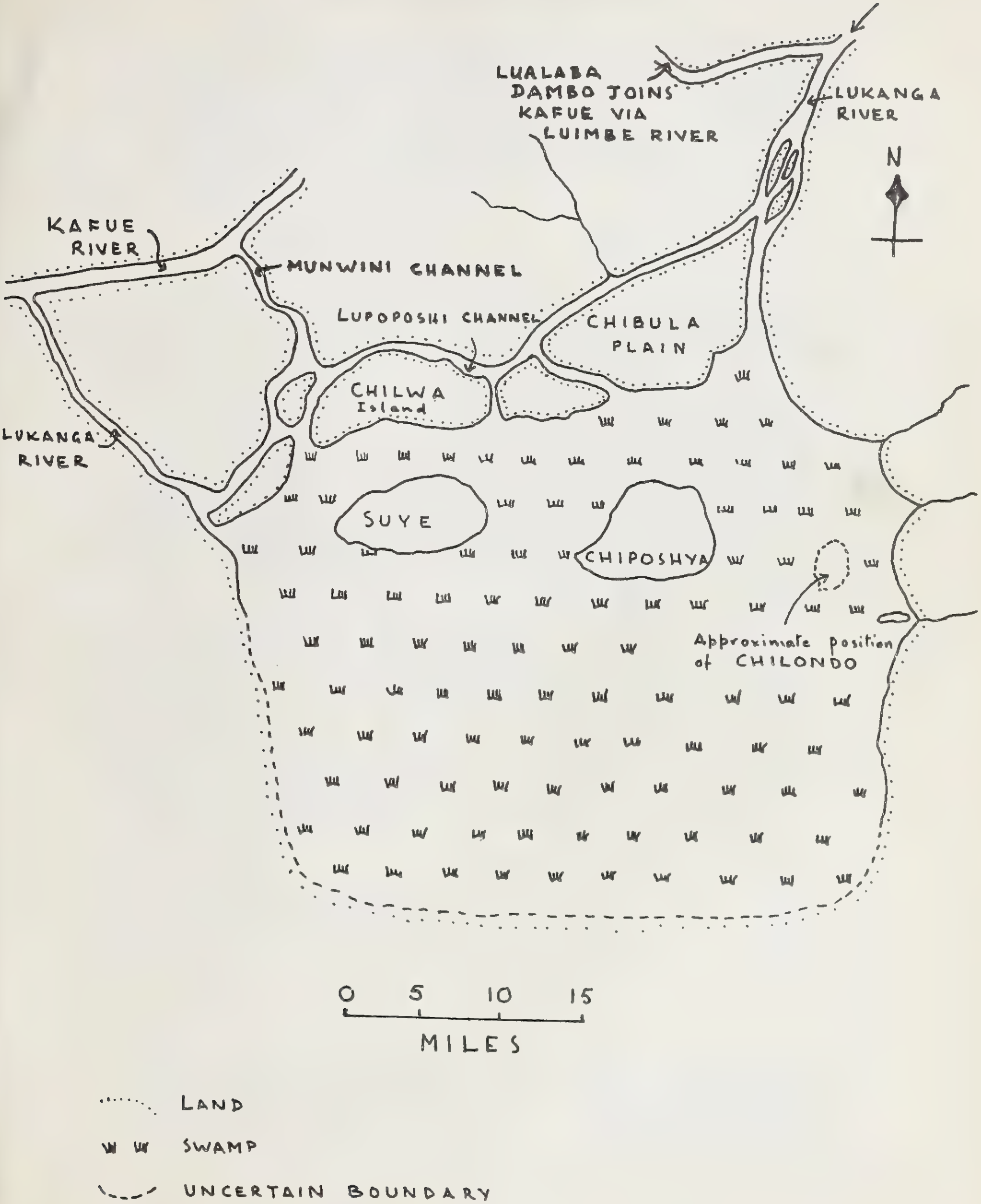


Fig. 2.—*Phragmites* zone. Very closely packed stems of *Phragmites communis* make the passage of boats other than dugouts difficult.

Plate II.

LUKANGA SWAMPS
(ADAPTED FROM MACRAE, 1934)



and submerged aquatics, while in others it is mixed with *Phragmites.* Floating islands become quite common in the *Typha* zone. Some are strong enough to hold one's weight; others are not. The larger mats tend to have some or all of the following species growing on them:

Aeschynomene sp.
Hydrocotyle sp.
Marsilea sp.
Cyperus nudicaulis
Pycreus mundtii
Scirpus cubensis
Leersia hexandra
Crassocephalum picridifolium
Polygonum tomentosum
Ludwigia leptocarpa

Phragmites communis is the dominant species of the outermost zone, succeeding *Typha* at depths greater than ten feet (Plate II, Fig. 2). On the margin of Chilondo *Phragmites* is rooted fifteen feet below, and the inflorescences tower up to fifteen feet above the surface of the water. In parts *Phragmites* forms almost impenetrable stands with the stems growing so closely that even water lilies are excluded. Large floating mats occur in the *Phragmites* zone and these are much used by African fishermen as platforms for drying fish and for temporary homes. The islands do not appear to extend more than three feet below the surface of the water and so they must be anchored by the stems of *Phragmites.* They have the same species growing on them as in the *Typha* zone. No sign of *Salvinia auriculata* was seen.

In parts the vegetation of the floating mats had been recently burnt off, whether or not this was accidental was not clear. According to the African fisherman it is possible for veld fires to sweep right across the swamps after a particularly dry season.

In the region investigated the four zones were spread over a width of approximately three miles. The *Eleocharis* zone is by far the most striking and well defined of the zones. The most tolerant species appear to be *Phragmites* and *Nymphaea,* as they are widely distributed in all but the shallowest water.

Although only a very small portion of the Lukanga Swamps was examined it seems likely that the sequence of zones—from shallow to deep water—i.e. *Leersia, Eleocharis, Typha* and *Phragmites*—is of more widespread occurrence in the swamps.

ACKNOWLEDGEMENTS

I am most grateful to the Rural District Commissioner, the schoolboys and Mr. Nightingale of Broken Hill for making the expedition possible. I also record my thanks to the University College of Rhodesia and Nyasaland for a travel grant.

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NOTES ON MESEMBRYANTHEMUM AND ALLIED GENERA

By H. M. L. Bolus

Scopelogena L. Bol. gen. nov.—Fruticuli compacti vel caespitosi, cum aetate robusti, glabri, ad 30 cm. diam. vel ultra; rami primarii ad 7 mm. diam.; partes herbaceae levissimae, glaucae vel subglauce virides; folia succulenta ascendentia, alterum paris saepe subfalcatum, supra plana vel leviter convexa, dorso rotundata vel obtuse carinata tumque lateraliter subcompressa, lat. visa apice rotundata vel obtusa vel abrupte acuta vel prope apicem leviter angustata acutaque, 3—5 cm. longa, 3—8 mm. diam.; cymae saepe 3—8 cm. longae, demum ± laxe ramosae, 7—15-fl. vel ultra; pedunculi 4—15 mm. longi, basi, vel prope medium, bracteati, bracteis foliis simillimis, interdum apicem receptaculum attingentibus; receptaculum subclavatum vel obconicum, ad 5 mm. longum, ad 7 mm. diam.; sepala 5, acuta vel acuminata, saepe 4—6 mm. longa, vel inter se subaequilonga, 2 intima late membranaceo marginata; petala 2-seriata, inferne non, vel leviter, angustata, obtusa lutea, 6—8 mm. longa, ad 1·5 mm. lata; staminodia nulla; filamenta fere ab initio erecta, ovarium partim, stigmata omnino, exponantia, inferne pallida, superne lutea, exteriora inferne ciliate papillata, intima prope medium papillatis; nectarium anulare, crebre crenulatum; ovarii lobi leviter compressi obtusi, demum ad 1 mm. elevati; stigmata gracilia, e medio superne angustata, viridia, 4—5 mm. longa; capsula infra subclavata acuteque 5-angulatum vel obconica nonque angulata, ad 6 mm. longa, supra ad 2 mm. elevatum, suturis vix compressis, expansa non iterum claudens, 1—1·2 cm. diam., valvis non alatis, carinis fere a basi divergentibus, muticis, dimidium valvae attingentibus, alis tegentibus latis sed brevibus, vix dimidium loculi tegentibus, tuberculo placentali nullo, seminibus numerosis, basim loculi attingentibus, obovatis, margine interdum minutissime echinata, aliter inconspicue tuberculatis, saturate brunneis, ca. ad 1·25 mm. longis.

Ad **Lampranthum** proxime accedit, sed valvis capsulae expansae exalatis, alis tegentibus loculi brevioribus, capsula expansa non iterum claudente, differt.

The name (which may be freely translated as cragborn or a crag-dweller by birth) is derived from the Greek *scopelos*, a crag, high rock or peak, and *genos*, genus, race, descendant, child—in allusion to these being the wonted habitats of this genus.

Species 2.

1. **Scopelogena veruculata** (L.) L. Bol. comb. nov.—Mesembrianthemum foliis veruculiformibus, floribus melinis umbellatis Dillen., Hort. Elth. t. 203, fig. 259. (1732). *Mesembryanthemum verruculatum* Linn., Sp. Pl. 486 (1753), Miller Dict., ed. 8, 33 (1768); Ait., Hort. Kew., ed. 1, 2 : 192 (1789); Haw., Obs. 260 (1794), Misc. 81 (1803), Synop. 258 (1812), Rev. 155 (1812); Willd., Sp. Pl. 2 : 1041 (1799); Ait. f., Hort. Kew., ed. 2, 3 : 211 (1811); Spreng., Syst. Veg. 2 : 250 (1825); DC., Prod. 3 : 438 (1828), Plant. Grass. t. 26 (1800); Salm-Dyck, Mesemb. § 39, t. 1 (1854); Sond., Fl. Cap. 2 : 428 (1862); Berger, Mesemb. 126 (1908); Jacobs., Handb. 3 : 1548 (1955). *Lampranthus veruculatus* (L.) L. Bol., Adamson and Salter, Fl. Cap. Pen. 385 (1950); Jacobs., Handb. 3 : 1212 (1960).

Cape Prov.: Cape Peninsula; "rocks W. of Lion's Head", fl. Oct. 1897, *A. H. Wolley Dod* 3663; Lion's Head, in fruit, Jan. 1897, *id.* 2420. Table Mountain, on rocks, alt. 2,000 ft., fl. Oct. 1902, *R. Marloth* 2581. Muizenberg, *A. E. Eastman* (Bolus Herb. 27107).

[There is no record available of this species having been collected beyond the limits of the Cape Peninsula.* The only collection cited by Sonder (Fl. Cap. 2 : 428) and by Berger (Mesemb. 127), as being this species, is that of *Ecklon* and *Zeyher* 2030 from "Mountain sides near Brackfonteyn, Clanwilliam". The portion of this collection in the Sonder Herbarium in Stockholm, which I have examined, is not **Scopelogena,** but almost certainly is a **Malephora.**]

This species was introduced into England in 1732 and was known as the "spit-leaved fig-marigold". The Linnaean specific name retains this similitude,** being the adjective derived from the diminutive form, *veruculum*, of the Latin *veru*, "a spit for roasting meat, a dart, a javelin". The leaves in the wild plants, however, are very rarely as acute as those portrayed in the cultivated ones.

2. **S. gracilis** L. Bol. sp. nov. A **S. veruculata** foliis gracilioribus, interdum obtuse carinatis, lateribus saepe subcompressis; receptaculo obconico; capsula infra obconica, non angulata.

Cape Prov.: in dit. Swellendam; Grootvadersbosch, Dec. 1958, *H. Hall* 1506. Typus. "Numerous but seen only on high precipitous cliff in almost permanent shade. Formed lanky bushes 2—3 ft. in diameter, their yellow flowers visible from several yards away. Very old bushes had pendent main stems one inch thick" (*Hall*). In dit. Riversdale; Glen Leith,

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*The same may be said of **Erepsia mutabilis** (Haw.) Schwant. Both Sonder (Fl. Cap. 2 : 414) and Berger (Mesemb. 196) have erroneously given the Uitenhage and Beaufort West Districts only as its localities, and have placed *Zeyher* 682 in the latter. But this collection, as represented in the Sonder Herbarium in Stockholm, is **Ruschia karroidea** L. Bol. from the Laingsburg District, and *Zeyher* 682 extends its range of distribution northwards.

**Assuming that the second "r" is a misprint or slip of the pen.

"on talus slopes below low cliffs among loose stones, also on rocky ledges and slopes of Table Mountain Sandstone, 400—700 ft.", *J. Muir* 4320. "Shrubby with moderately thick, brittle stems 12—18—24 inches long, erect, erect-patent or loosely decumbent or spreading on the slopes and becoming erect at end (ascending). Appearing at a distance as grey clumps. Fls. yellow, small, scented like Nymphaea capensis Thunb". (Muir). Little Karoo, fl. Oct. 27, 1929, *P. Ross Frames* (Bolus Herb. 27108).

This genus is in the group of fruticose plants containing, among others, the two large genera, **Lampranthus** and **Ruschia,** which have parietal placentation of the ovules; capsular fruit with 5—6 covered loculi, with or without a placental tubercle, and winged or wingless valves; and an anular nectary. It is separated from **Lampranthus** chiefly by the absence of valve-wings, and from **Ruschia** by the absence of the placental tubercle and by the yellow colour of the petals, which does not seem to occur in the genus, and from both by the capsule not closing again after the first expansion. (This characteristic was observed first by Mr. H. Hall in the course of his duties at Kirstenbosch and was recorded by him as being constant.) It is also one of the distinguishing characters of **Stoeberia,** which differs from **Scopelogena** in having both winged valves *and* placental tubercles.

Trichodiadema aurea L. Bol. sp. nov.—Planta 1 visa, fera, 12 cm. alta; radix 13 cm. longa, inferne tuberosum, tubere 9 cm. longo, ad 3·5 cm. diam.; caulis lignosus, 8 mm. diam., reliquiis annorum priorum onustus; rami primarii ad 5 mm. diam., hornotini ad 8 cm. longi, internodiis novellis capillaceo papillatis, cum aetate asperis vel levibus, 5—10 mm. longis, ad 1·5 mm. diam.; folia ascendentia, supra plana obtusa, dorso rotundata, lat. visa superne vix angustata, obtusa, papillis basi apiceque brevissime setiferis, setis apicalibus saepius deflexis, ad 12 visis, gracillimis albis, ad 3 mm. longis, viridia, 5—6 mm. longa cum vagina 0·5 mm. longa, ad 2 mm. lata; pedunculi molliter papillate pubescentes, 2—8 mm. longi; receptaculum globose obconicum vel subglobosum, cum sepalis longe papillate pubescens, 2—3 mm. longum, 3—5 mm. diam.; sepala 5, fere aequalia, obtusa, in flore minimo 2 mm., in maximo ad 4 mm., longa, basi 1—2 mm. lata, interiora marginata, setis apicalibus bene evolutis; petala 3-seriata, e prope medium inferne angustata, obtusa aurea, basi pallida, externe aurantiaca vel pallide roseo tincta, in flore minimo ad 6 mm., in maximo ad 8 mm., longa, ad 1·5 mm. lata; staminodia pallida, stamina erecta conferta bene excedentia; filamenta 4-seriata, pallida, ad 3 mm. longa, interiora prope medium papillata, antheris pollineque luteis; glandulae subapproximatae; ovarium supra planum, deinde medio obtuse 5-lobatum, lobis altitudinem glandularum attingenti-

bus; stigmata 5, anguste subulata, dimidio superiore caudato, 1·25 mm. longa.

Cape Prov.: Willowmore Div.; "15 miles E. of Willowmore", Sept. 28, 1961, *F. J. Stayner.* Karoo Garden 628/61.

Ruschia inclaudens L. Bol. sp. nov.—Glabra, "dense compacta" (*Esterhuysen*); rami plures visi, rigidi, copiose compacteque ramulosi, ad 21 cm. longi, ad 4 mm. diam., internodiis 1—2 cm. longis, cuticula brunnea; ramuli ultimi floriferi 2-foliati vel rarius 4-foliati, pari inferiore multo minore marcescenteque; folia anni prioris persistentia induratissima, hornotina ascendentia vel fere erecta, supra linearia vel oblonga, acuta vel acuminata, conspicue demumque subpungente apiculata, leviter convexa, dorso rotundata, lateribus convexis, lat. visa e medio superne angustata, acuta, altero paris interdum subfalcato, lamina 1·3—2 cm. longa, medio 5—7 mm. lata diametroque, vagina vera ad 4 mm. longa, impresse lineata, ad per 7 mm. decurrente; flores solitarii, expansi non iterum claudentes; pedunculi teretes, 2—6 mm. longi, prope basim bracteati, bracteis a foliis sat conspicue differentibus, lat. visis superne gradatim angustatis, marginibus membranaceis, ad 9 mm. longis, medio ad 2 mm. diam.; receptaculum globose obconicum, 3—4 mm. longum, 6—7 mm. diam.; sepala 5, subaequilonga, e medio superne angustata, acuta vel acuminata, dorso convexa, dimidio superiore mox marcescente, ad 6 mm. longa, basi 2—4 mm. lata, intima sat anguste marginata; petala 3—4-seriata, exteriora parum inaequilonga, intima pauca, in staminodia transeuntia, e prope medium inferne angustata, obtusa vel emarginata, roseo purpurea, ad 1·3 cm. longa, 0·5—2 mm., vel rarius ad 3 mm., lata; staminodia saepius staminibus breviora vel ea aequantia, inferne alba superne rosea; filamenta mox fere erecta, ca. 5-seriata, fere omnino rosea, intima parum supra basim longe papillata, antheris pollineque aureis; discus quasi e glandulis 5 coalitis compositus, crenulatus; ovarium circa marginem planum, medium versus leviter elevatum, lobis dorso complanatis; stigmata 5, gracilia, superne attenuata, 4—5 mm. longa; capsula senecta tantum visa, valvis exalatis, carinis parum ultra dimidium valvae attingentibus, muticis, tectis brevibus, tuberculis nullis (?esis), sed tamen in flore senectissimo tuberculis immaturis manifestis.

Cape Prov.: in dit. Robertson; Dassieshoek Peak, Langeberge, prope Robertson, alt. 4,000—5,000 ft., "in shallow soil on rock, along crest of rocky ridge, south side of peak, growing in dense clumps", Sept. 3, 1961, *E. Esterhuysen* 29136.

Lampranthus affinis L. Bol. sp. nov.—Plantae 2 visae, erectae glabrae, ad 20 cm. altae; rami primarii 5 mm. diam., florentes cum flore ad 16 cm. longi, 1·5—2 mm. diam., internodiis 1·5—4 cm. longis; folia ascendentia vel patentia, fere semiteretia, supra plana vel superne convexula, lat. visa prope apicem vix angustata, abrupte acuta vel obtusa vel oblique truncata, levia, subglauce viridia, ad 2·5 cm. longa cum vagina 1 mm., 1·5—2 mm., vel rarissime ad 3 mm., lata diametroque; flores solitarii vel interdum 2-nati; pedunculi 3—4 cm. longi, prope medium bracteati; receptaculum subclavatum, 7 mm. longum, ad 6 mm. diam.; sepala 5, exteriora ex infra medium superne angustata, acuminata, ad 9 mm. longa, basi 4 mm. lata, interiora ample marginata, ad 7 mm. longa; petala exteriora 4-seriata, e medio inferne leviter angustata, obtusa, sat pallide pulcherrime rosea, nitentia, infra pallidiora, 1·8—2·3 cm. longa, 1·5—2 mm. lata, interiora 4-seriata, in staminodia transeuntia, 8—14 mm. longa, 0·5—1 mm. lata, intermedia cum interioribus erecta manentia, intima ad staminodia appressa; staminodia stamina conice conferta omnino occultantia eaque bene excedentia, pallide rosea vel alba; filamenta ca. 5-seriata, alba, exteriora basi tantum ciliate papillata, intima basi copiose papillata, papillis interdum roseis, antheris pollineque albis; ovarii lobi obtuse compressi, vix ad 1 mm. elevati; stigmata 5, subulata, ad 3 mm. longa cum cauda ad 1 mm. longa.

Cape Prov.: in dit. Prince Albert, Meiringspoort, *F. J. Stayner*. Karoo Garden 794/60 Fl. Oct.—Nov. 1961.

L. affinis forma.—A typo foliis ad 5 mm. diametro differt. "On S.E. shady side of Meiringspoort, hanging down in great clusters 5 feet wide and 2 feet deep", *F. J. Stayner*. Karoo Garden 842/60 Fl. Oct.—Nov. 1961. "This and the type were grown in full sun in the Karoo Garden" (*Stayner*).

This species belongs to the section *Haworthiana* Salm Dyck, which up to 1849 contained the following species, probably all described from plants raised from seed in England—*M. stipulaceum* L. (1753), *M. haworthii* Don (1800), *M. coralliflorum* Salm Dyck (1836)—a new name required for *M. corallinum* Haw. (1821), previously used for what is now **Psilocaulon corallinum** (Thunb.) Schwant., *M. productum* Haw. (1824), *M. Zeyheri* Salm Dyck (1849)—all of which were combined with **Lampranthus** by N. E. Br. in 1930. **L. affinis** has close affinities to all these (except **L. productus**, which has 3-nate flowers and the outer elongated sepals produced beyond the length of the petals), and is nearest to **L. coralliflorus** in the leaf-shape, but differs widely from this species, as represented by Salm Dyck (there is no type-specimen and Haworth's description is very brief), by having the petals in a more numerous series of lengths. In this respect it resembles the remaining 3 species, all of which have leaves tapering towards the apex. The upright position of some of the intermediate and inner petals, which appears to be maintained until they droop or

wither, was not recorded in any of the species previously described. It remains to be seen, however, whether the normal position may be resumed or not in prolonged cultivation.

Pherolobus maughanii N. E. Br. var. **Stayneri** L. Bol. (Journ. S.A. Bot. 27 : 257). Capsula infra breviter crateriformis, 5-angulata, angulis rotundatis, apice constricta, sat conspicue nervata, ad 4 mm. longa, supra vix elevata, inter suturas valde compressas valde concava, ad 1 cm., expansa 1·6 cm., diam., valvis reflexis, carinis erectis distantibus, superne divergentibus, tenuibus, ± lacerulatis, aristatis, aristis apicem valvae attingentibus, alis valvae e basi liberis, sed carinis adnatis, alis tegentibus bene evolutis; semina subtruncate obovata, brunnea levia, ca. 1 mm. longa.

E. capsulis collectionis typici apud Kirstenbosch maturatis (N.B.G. 591/61) et e speciminibus fructiferis a *W. F. Barker* in loco typico collectis descripta.

Corrections and Additional Notes

Vol. XXVI: 161—162. **Stoeberia hallii** L. Bol. and **S. littlewoodii** L. Bol. These two species have been erroneously placed in **Stoeberia.** The presence of both valve-wings and placental tubercle in the capsule, as in **Stoeberia,** excludes them from **Ruschia** and **Lampranthus.** But the valves do not remain permanently erect after the first opening, as in **Stoeberia,** which excludes them also from this genus. A new genus is, therefore, required for them and for a number of other species, of which some in the greater development of the tubercle incline more towards **Ruschia,** and some in the more ample valve-wings to **Lampranthus.**

Vol. XXVII: 63, line 4. **Ruschianthus falcatus** L. Bol. flowered again at Kirstenbosch this October and produced well developed 3-nate flowers.

—p. 120, line 36. **Stoeberia apetala** L. Bol.—The second part of this collection developed into a fine plant at Kirstenbosch, and within 8 months produced flowers with very short and rather frail petals, enclosed within the sepals, exactly as in **R. micropetala** L. Bol. (These were not visible in the wild plant of **S. apetala**). The capsule of the type of **R. micropetala** was not described, and it is essential that it be known before this species can be placed correctly. If it should prove to be like that of **S. apetala,** which agrees both in structure and in seeds with that of typical **Stoeberia,** then it is erroneously sunk, as at present, in **Ruschianthemum gigas** (Dtr.) Friedr.

—p. 257, line 9. **Cephalophyllum calvinianum** L. Bol.—This has proved to be the same as **C. roseum** (L. Bol.) L. Bol.—*Leipoldtia rosea* L. Bol.

Mesemb.: II: 13 (Jul. 1927), and becomes its second synonym. This regrettable error has not even been the means of adding anything important to our knowledge of the species.

—Line 11. For 6—7 mm. etc., read 6—7 mm. diam., internodiis inclusis; partes herbaceae

—p. 258, line 11. Specimens of the type collection produced ripe fruit at Kirstenbosch and Miss Barker collected fruiting specimens in the type-locality in October. The capsule differs from that of **Dorotheanthus** in (1) not having accrescent and persistent sepals and stigmas, (2) the lower part of the capsule being rather conspicuously veined, and not smooth and spongy, and (3) the keels being erect, narrow, thin with ± lacerated margins, and pallid, and not flat broad and almost black.

—p. 263, line 26. For SPECIES read GROUPS.

—p. 264, line 22. For (N.E.Br.) read (L. Bol.).

The genus **Cephalophyllum** is among the earliest to have been introduced to botanists in Europe, the first figures recorded being those of J. Petiver, Gaza. 77 : fig. 10 (1702—1709) and R. Bradley, Hist. Succ. (1716—1727), followed by those of Dillenius, Hort. Elth. (1732). Up to 1832 a few species were added by A. H. Haworth; but it was not until about 1920 that additions were made by botanists in South Africa. In 1928—29 N. E. Brown listed 29 species (of which 2 are *nomina nuda*). This number has since been increased to more than 70 species, which range eastwards as far as the Uniondale Division, chiefly along the coastal districts, with a few in the western karoo, and northwards from the Cape Peninsula through Bushmanland and Namaqualand to South-West Africa. They are entirely glabrous throughout, and their flowers, with one exception (**C. staminodiosum**) are without staminodes. With one exception also (**C. frutescens**) they are lowly in their habit of growth. But no other genus of the *Mesembrieae* has so many species with such beautiful flowers. All shades of yellow are found in the petals, from lemon and primrose to golden and orange, sometimes varied with a red spot at the base, or with a red line down the middle of the back. Salmon pink, various shades of rose and rose-purple, sometimes burnished with a copper sheen, and red occur, culminating in the rich ruby tones of **C. alstonii.** Frequently the colour of the stamens contrasts with that of the petals, dark red and brown usually contrasting with yellow petals and dark purple ones with the rose-tinted petals.

The name of the genus is derived from the Greek *kephale* = head, and *phullon* = leaf, because in the earliest species known tufts or "heads" of much longer leaves were formed from which elongated branches grew out in all directions, bearing smaller branchlets with shorter leaves.

But this habit is not constant in the genus and the following key may serve to show how it may be roughly divided into 7 groups, based upon the slighter variations there are in the general uniformity of its habit of growth.

KEY TO THE GROUPS

1. Heads of leaves conspicuous.		
2. Primary branches diffuse, elongated, rooting at the nodes ..	e.g. *C. cedrimontanum* ..	ELONGATA.
2. Primary branches usually more compactly arranged, not rooting at the nodes	e.g. *C. pillansii* ..	DECUMBENTIA
1. Heads of leaves inconspicuous or absent.		
3. Primary branches rooting at the nodes	e.g. *C. procumbens*, *C. stayneri*.	REPTANTIA.
3. Primary branches not rooting at the nodes.		
4. Primary branches elongated, prostrate normally or scrambling where support is available ..	e.g. *C. spongiosum* ..	PROSTRATA.
4. Primary branches not elongated, ± erect.		
5. Plants compact or caespitose, low-growing.		
6. Rootstock woody and thick with age; internodes enclosed in wild plants ..	e.g. *C. subulatoides*. ..	ABBREVIATA.
6. Roots fibrous, where known; internodes ± visible ..	e.g. *C. pulchellum* ..	CAESPITOSA.
5. Plant frutescent up to 60 cm. in height (1 species, with a decumbent form)	e.g. *C. frutescens* ..	FRUTESCENS.

Cephalophyllum compressum L. Bol. sp. nov.—Planta integra non visa; rami plures floriferi, cum floribus ad 21 cm. longi, tantum visi, nodis non radicantibus, internodiis latere altero plano, altero convexo, 3—5 cm. longis, 3—5 mm. diam.; partes herbaceae pallide glauce virides; folia ascendentia vel saepe alterum paris erectum, alterum adscendens

vel patens, supra plana vel leviter convexa, acuta, prope apicem carinata vel matura dorso omnino rotundata vel carina ad lineam reducta, lat. visa prope apicem angustata, acuta vel obtusa, levia, 3·5—5 cm. longa cum vagina ad 6 mm. longa, medio 6—8 mm. lata, 6—9 mm. diam.; flores 3-nati vel 2-ternati, lateralibus tarde evolutis; pedunculi 2·5—5 cm. longi, basi bracteati, bracteis ultimis interdum carinatis lateraliterque visis acutis aristatisque, 8—10 mm. longis; receptaculum ad 3 mm. longum, 7 mm. diam.; sepala 5, acuta, 7—11 mm. longa, basi 4—7 mm. lata, exteriora superne carinata; petala 3-seriata, ex infra medium inferne angustata vel interdum vix angustata, obtusa vel obscure emarginata, laete lutea, 1·7—2 cm. longa, 1·5—2 mm. lata; stamina ca. 4-seriata, lutea, filamentis ad 3 mm. longis vel parum ultra; ovarium e disco abrupte ad 2 mm. elevatum, lobis e basi acute compressis; stigmata 10, sat gracilia, 4 mm. longa cum cauda 0·75 mm.; capsula expansa 1·4 cm. diam.

South-West Africa; Witputs; Jun. 1938, *E. Erni* (S.U.G. 11073). Fl. Apr. 1939.

Another **Cephalophyllum** was collected at Witputs by Mr. E. Rusch in July 1933, which flowered in the Stellenbosch University Garden (848) in July 1936. This is represented in the Bolus Herbarium by 3 short flowering branchlets. It also has acutely compressed ovary-lobes and what, judging by the buds, might eventually have become a 2-ternate inflorescence. It differs from **C. compressum** in having the leaves more narrowed towards the base and rounded at the apex in side view, narrower sepals, broader petals (up to 3 mm. broad), more conspicuously narrowed downwards, golden, reddish towards the apex and on the back. The material seems too scanty to constitute the type of a new species, but it is hoped these notes made from the living specimens may lead to further collections from this locality.

Cephalophyllum concinnum L. Bol. sp. nov. (*Reptantia*).—Planta ca. 60 cm. diam.; rami primarii reptantes, senectissimi lignosi, ad 6 mm. diam., hornotini subflexuosi subcomplanati 2-angulati, breviter alati, ad 30 cm. longi, internodiis 1—3·5 cm. longis, 2—3 mm. diam.; ramuli ultimi ad 6-foliati; folia ascendentia, matura supra visa plana, apice rotundata vel rarius subacuta, dorso rotundata vel obtuse carinata, lat. visa saepe superne dilatata, 2·5—5·2 cm. longa cum vagina 3—6 mm. longa, medio ad 6 mm. lata, prope apicem ad 9 mm. diam., carinis novellissimis interdum obscure serrulatis; flores 1—2-nati, ad 6 cm. diam. (manu complanati); pedunculi in receptaculum gradatim transeuntes, 2—3 cm. longi, basi bracteati, bracteis lat. visis interdum superne dilatatis, 1·5—2 cm. longis, prope apicem ad 7 mm. diam.; sepala 5, obtusa, exteriora in flore maximo viso supra medium conspicue incrassata igiturque globosa, ad 1·2 cm. longa, basi 5—6 mm. lata, interiora apice breviter obtuseque subulata, 8—9 mm. longa, basi 6 mm. lata, vel in floribus minoribus fere aequilonga, ad 8 mm. longa, ad 6 mm. lata; petala 4-seriata, intima pauca, e prope medium inferne angustata, prope apicem saepe leviter angustata, obtusa vel acuta, purpureo rosea angustissime saturatioreque vittata, 1·5—2·6 cm. longa, 0·75—2 mm. lata; filamenta saepe 3-seriata, alba, interiora breviter ciliate papillata, ad 5 mm. longa, antheris atrate purpureis vel saturate purpureo brunneis, polline pallidissime roseo vel griseo; ovarium e disco gradatim leviterque, vel in floribus ceteris ad 2 mm., elevatum, lobis obscuris, minute nitente tuberculatis; stigmata 8—10, in genere inter gracillima, superne attenuata, breviter caudata, ad 5 mm. longa.

Cape Prov.: in dit. Calvinia; "18 miles N.E. of Nieuwoudtville", Sept. 1960, *F. J. Stayner*. Karoo Garden 548/60. Fl. Jun. 1961.

Haec species etiam sunt collectiones sequentes.—Karoo Garden 553/60: in dit. Calvinia; "5 m. N.E. of Nieuwoudtville", Sept. 1960, *F. J. Stayner*. Idem 131/61: "Hantam River, near Loeriesfontein, Apr. 1961", *F. J. Stayner*.

In its floral characters this species resembles **C. serrulatum** L. Bol., which also has purple-rose petals, similar stamens, except that the shortly ciliately papillate filaments are not recorded, and also the same slender, but shorter, stigmas. The type-material of the older species consists of flowering branchlets only, and the branches are merely described as being "decumbent", without any mention of a creeping habit. But the type-plant had been in cultivation for about 9 years (unless some confusion of labels had occurred) before it was described and drawn, and considerable changes, vegetatively, may have taken place during that time; whereas that of the present species, flowering about 9 months after its collecting, retained much of its wild growth. In some of the very young leaves, however, the keel is obscurely serrulate, and the only other species in which this has been recorded is **C. serrulatum**.

Cephalophyllum littlewoodii L. Bol. sp. nov. (*Decumbentia*).—Plantae ferae 2 visae, in genere gracillimae notae; caulis ca. ad 7 mm. diam.; rami primarii decumbentes sed tamen non radicantes, ad 18 cm. longi, internodiis 2—6 cm. longis, ad 1·5 mm. diam.; folia in "cephala" inferne supra complanata, superne teretia, e parum supra medium superne attenuata, molliter apiculata, subglauce viridia, ad 6 cm. longa, 1—2 mm. diam., cetera ad 2 cm. longa; flores solitarii; pedunculi conspicue intrusi, 2·5—3·5 cm. longi, bracteis prope basim positis, 1—2 cm. longis; receptaculum semiglobosum, cum aetate breviter crateriforme, tuberculatum, 3 mm. longum, 6 mm. diam.; sepala 5, tuberculata, basi 2—3 mm.

lata, exteriora e parum supra basim acute subulata, ad 7 mm. longa, interiora marginata, 3—5 mm. longa; petala ca. 5-seriata, inferne leviter angustata, saepius obtusa vel emarginata, infra laete rosea, supra rosea, vel utrimque purpureo rosea, ad 1·3 cm. longa, 0·5—1·25 mm. lata; filamenta ca. 4—5-seriata, pallide rosea, ad 5 mm. longa, antheris roseo purpureis, polline roseo; ovarium nitente tuberculatum, e disco ad 1 mm. elevatum, lobis leviter obtuseque compressis; stigmata 13, apice pallide roseo suffusa, gracillima, ad 2·5 mm. longa; capsula immatura 1 cm. diam.

Cape Prov.: in dit. Worcester; Bos Kloof, De Wet, Sept. 10, 1961, *R. C. Littlewood.* Karoo Garden 556/61.

(*To be continued.*)

Note.—The type specimens of all new species described in this paper are in the Bolus Herbarium, University of Cape Town, Rondebosch.

EMBRYOLOGICAL AND CYTOLOGICAL INVESTIGATIONS IN *HYPODISCUS ARISTATUS* NEES (RESTIONACEAE)

Stefan Krupko

(With Plates III and IV)

ABSTRACT

1. *Hypodiscus aristatus* has an ovule which arises as an anatropous initial and later becomes an orthotropous ovule by fusion with the carpel. This could be called a secondary orthotropous condition.

2. *Hypodiscus aristatus* has a monosporic embryo sac of the Polygonum type with 3 non-dividing antipodals and a nuclear type of endosperm.

3. The great majority of mature pollen grains have 3-nuclei. The tube nucleus is deficient in D.N.A.

4. It was found that the diploid chromosome number is 32 + 2 satellites. Idiograms of chromosome sets for both male and female plants show perfect similarity. Chromosome counts in meiotic metaphase I were in accord with the above finding.

5. Adventitious roots of both sexes have a many-layered pericycle.

6. The wall of the anther has 4 layers. Its opening mechanism is similar to that in the genus Lilium.

INTRODUCTION

The family Restionaceae has long attracted attention because of its geographical distribution, its morphological features (evidently transitional between the Liliiflorae, Glumiflorae and Cyperales), and its anatomical structure. The anatomy of the family was treated in detail by Solereder and Meyer[17]. Its taxonomy has been the subject of a monograph by Pillans[13,14], and more recently Adamson and Salter have discussed the family in their *Flora of the Cape Peninsula*[1]. However, the cytological and embryological investigation of the family has not kept pace with these other studies. To the best of the present author's knowledge there is only his own and his student co-workers' short paper on *Restio Dodii* and *Elegia racemosa*[2], and his short preliminary report in Polish on *Hypodiscus aristatus*[8]. The present paper is a further modest attempt to fill the gap in our knowledge of the cytology and embryology of Restionaceae.

Hypodiscus aristatus was chosen for the investigation chiefly because it differs sharply from other genera and species of this family in its fruits, unbranched stems, its general shape and the marked difference between male and female inflorescences.

TECHNIQUE

The material was collected on the slopes of Table Mountain and its associated ranges near Cape Town in September 1955 and 1956, from such localities as Steenberg plateau, Muizenberg plateau, Camps Bay and Wynberg plateau. The root tips were cut and put into the fixative immediately, at the place of collection. Stems with inflorescences were brought back to the Department of Botany at the University of Cape Town and dissected and fixed there. The following fixatives were used: Navashin fluid, F.A.A., acetic alcohol. The older ovaries were treated after fixation with 20% hydrofluoric acid for 3 days to soften them. After this treatment, and before dehydration and embedding, the material was washed for 24 hours in flowing water. In spite of this precaution it was found that staining with the Feulgen method and with crystal violet was somewhat affected. The following stains were used: Crystal violet after Newton, iron haematoxylin with fast green, safranin with fast green, acetocarmine, and the Feulgen method. In the Feulgen method hot hydrolysis with 1 N HCl was compared with cold hydrolysis with 5 N HCl. The latter was found very satisfactory. The optimum time of hydrolysis in the case of the ovaries of *Hypodiscus aristatus* was 70 minutes.

When working at the Botany Department, University of the Witwatersrand, Johannesburg, a good research microscope with a fluorite oil immersion lens was used. Afterwards at the Poznań University, Poland, a research microscope with two kinds of phase contrast equipment and a condenser was used. The latter was found to be a very practical and convenient research instrument. A camera lucida and new tubular apparatus for drawings were used.

OVULE DEVELOPMENT

The Restionaceae are placed by many authorities on taxonomy, e.g. Warming[18], Wettstein[21], Engler[4], Hutchinson[6], in the order Enantioblastae chiefly on the grounds of their orthotropous ovule. This type of ovule distinguishes the Restionaceae from the very similar Juncaceae (order Liliiflorae or Glumiflorae), or even Cyperaceae, which have anatropous ovules.

In the ontogeny of the ovule in such a family as the Liliaceae or the Gramineae (Andropogoneae) the initial of the ovule starts as a straight continuation of the funiculus. It starts so to say, with the orthotropous stage. At a much later stage, corresponding to the tetrad stage in the nucellus in some Andropogoneae, its upper part starts to bend, one side approaches the funiculus closely and finally it becomes anatropous.

In *Hypodiscus aristatus* however, the earliest initial of the ovule is always anatropous.

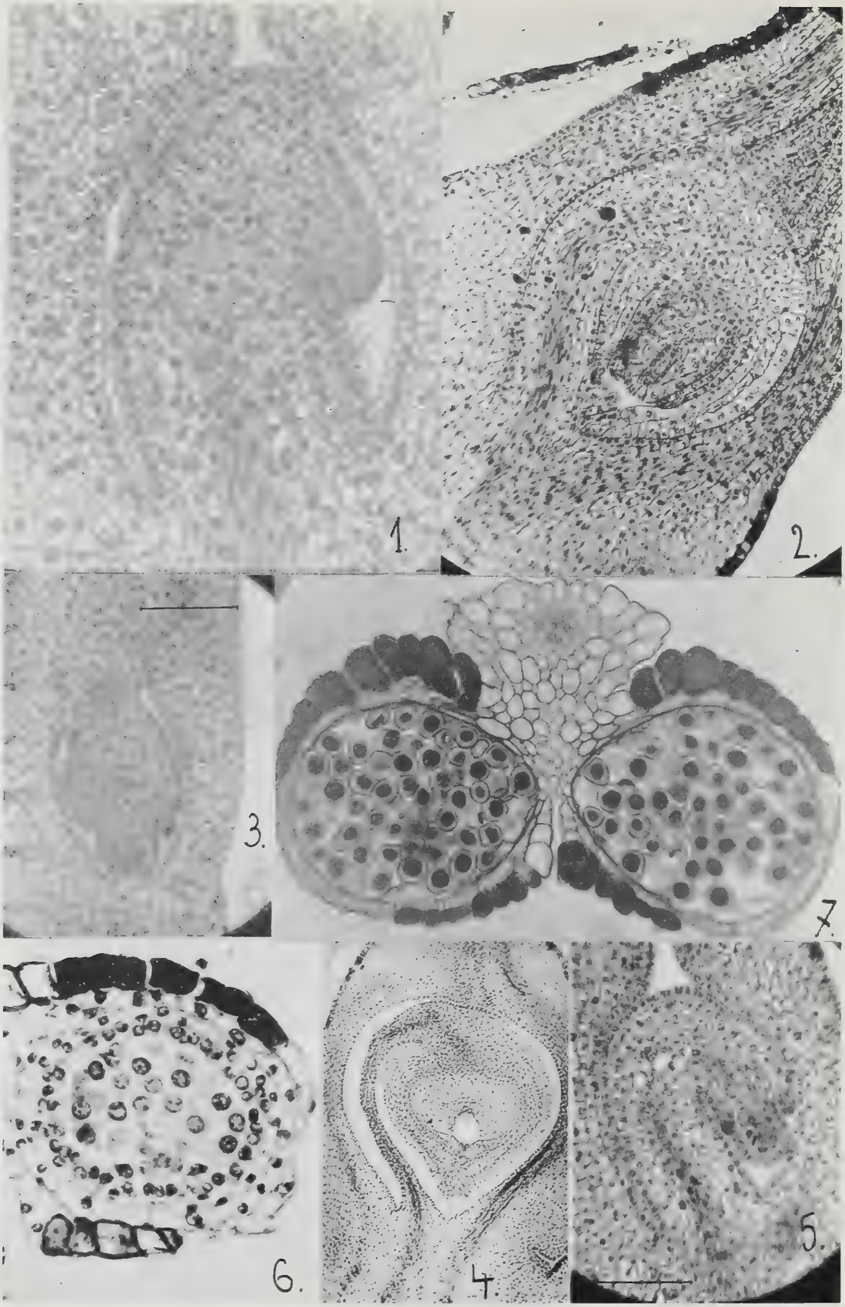

Plate III

This initial is represented by the small bent down portion at the top of the funiculus. It consists of the nucellus only, preceding any internal differentiation in it and preceding integument initiation (Plate III, Fig. 1). The funiculus as seen in median longitudinal section is an unexpectedly large organ. It is many layers of cells thick. It arises at the bottom of the ovary, when the latter already consists of two carpels and a style. At this stage the funiculus and the initial of the ovule have a distinct epidermis. They are sometimes, even at a more advanced stage, completely free of the carpels (Plate IV, Fig. 16). A narrow slit can be seen between the funiculus, bent initial of the ovule and the inner epidermis of the carpels. At this early stage the inner epidermis lines the whole cavity of the ovary. It makes the line of separation between the funiculus, the top of the bend, the ovule and the carpels, easy to distinguish (Plate III, Fig. 5).

The funiculus is a very peculiarly-shaped, broad organ. In transverse section it is a rather flat organ, crossing the chamber of the ovary from one wall to the other. It is tallest and thickest in the part where it initiates the ovule.

The author still has some hesitation in offering an interpretation of this structure. It might be called the third carpel, but two of its features are against this: (1) it arises much later than the two carpels forming the

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PLATE III

FIG. 1.—Slide 10, thickness 8 μ, obj. 45, oc. 10, magnif. after enlargement of photo ± 375.

The initial of the ovule without integuments. The ovule and the filament are free of carpels. Anatropous condition. The earliest observed stage.

FIG. 2.—Slide 8, 2/1, thickness 8 μ, taken with obj. 10, oc. 15, enlargement about 200.

Older stage of the ovule. Line of separation very clear, but the beginning of the fusion on the top of the bend can be seen.

FIG. 3.—Slide 1^b, thickness 10 μ, taken with obj. 45, oc. 5, magnif. after enlargement about 250.

Older stage of the ovule; both integuments are present. The ovule is fused on the top with the carpel. Orthotropous condition.

FIG. 4.—Slide 160, 2/2 thickness 12 μ, ph. centr. obj. 10, oc. 10, magnif. about 85.

The ovule is mature and fused at the top, in its chalazal part, with one carpel. The stage—mature embr. sac. The vasc. trace supply only through the funiculus—a reminder of the early anatropous stage.

FIG. 5.—Slide 2^c, 2/7, taken with obj. 45, oc. 5 enlargement about 250.

The funiculus and the ovule are still free of the carpels but touch them. The line of separation is clear.

FIG. 6.—Slide 24^b, taken with obj. 45, oc. 10, enlargement about 500.

Pollen grain mother cells in young anther. The anther wall shows 4 layers.

FIG. 7.—Slide A_5, taken with obj. 10, oc. 15, magnif. after enlargement about 200.

An advanced stage of the anther wall; spiralisation in endothecium, tannins in the remains of epidermis, connective.

ovary and internally to them; (2) in the majority of plants it fuses completely with the wall of the ovary in the later stages. On the other hand it could be considered a funiculus, but the following features are against it: (1) it is very thick in median longitudinal section, unlike the typical funiculus, and (2) it is very broad, stretching from wall to wall across the whole chamber. In view of the above hesitation, and since one is compelled to name it somehow, temporarily, it shall be provisionally referred to as a funiculus.

The first fusion occurs at the top of the funiculus bend (Plate III, Fig. 2). The part which first touches the carpel is the highest point of the funiculus and of the ovule initial. It more or less corresponds to the chalaza of the ovules or a little above the chalaza. Contact is soon made along the whole length of the funiculus, the ovule facing the internal epidermis of the carpels. Due to two epidermal layers, one on the funiculus, the other on the inner side of the carpel, the line of separation is visible even at the stage when two integuments are present and the micropyle is formed (Plate III, Fig. 2). Here two further behaviour peculiarities of the funiculus and of the ovule may be noticed: (1) the funiculus can more or less completely fuse with the carpels. Advanced fusion is shown in Plate III, Fig. 3. Thus the ovule achieves the orthotropous stage; (2) or the funiculus may be left free of the carpel even after fusion of the ovule with the carpel has occurred (Fig. 1).

Fusion of the ovule with the carpel may be achieved in two ways: (1) either it is a simple fusion with one carpel only as in Plate III, Fig. 3, or (2) it is a fusion with both carpels as in Fig. 2. One can see from Plate III, Fig. 4 that the funiculus can serve as a partition wall in the cavity of the ovary dividing it into two unequal chambers. This occurred in a minority of cases. In the majority of plants the funiculus fuses more or less completely with a carpel when the ovule matures, thus leaving the ovary one-chambered. The above fact that the ovary can have either one or sometimes two chambers has been long appreciated by monographists of the family (R. S. Adamson, N. S. Pillans), but the nature of this partition wall was not recognised.

The importance of vascular bundle traces in ovules for taxonomic and morphological considerations was recognised by many scientists, e.g. Warming[19], Netolitzky[11]. In this respect one may find two conditions in *H. aristatus.* In one of these the procambial bundle enters the funiculus and passes through it up to the chalaza of the ovule. This may be found in the ovaries, in which the funiculus functions as a partition wall between two chambers (Plate III, Fig. 4, note the ovule here is anatropous). Or it may as frequently be found in the funiculus which has fused with the carpel. Sometimes even at a very early stage of the ovule, as in Plate III, Fig. 5, one may find the procambial bundle entering through the funiculus and passing

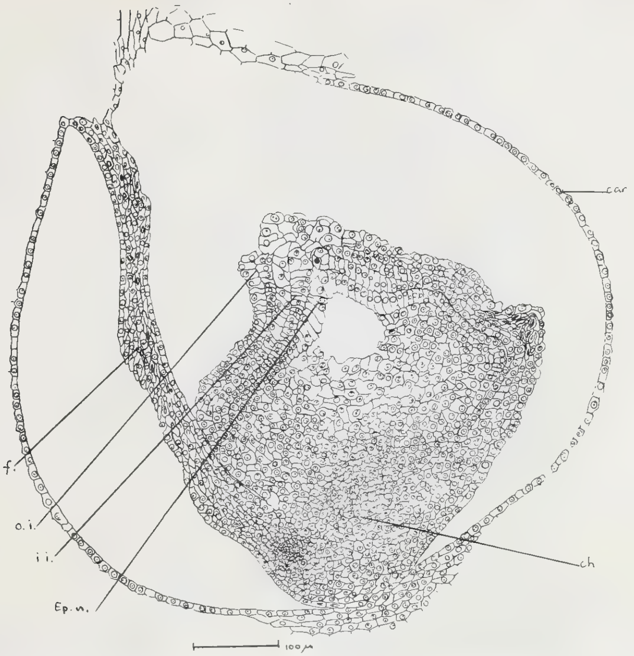

Fig. 1.—Slide 31 2/4, thickness 10 μ, fix. F.A.A., stain: I—Hemat. + Fast green, obj. 10, ocular 15, magnif. 200.

Ovule with mature em. sac. Funiculus forming partition wall between 2 chambers. Fusion with the carpel.

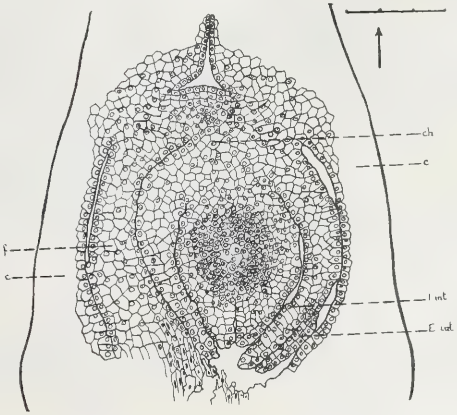

Fig. 2.—Slide 30, 1/3, thickness 10 μ, fix. F.A.A., stain: I—Hemat. + Fast green, obj. 10, oc. 15. Magnif. 200.

Ovule in orthotropous condition, fused with 2 carpels.

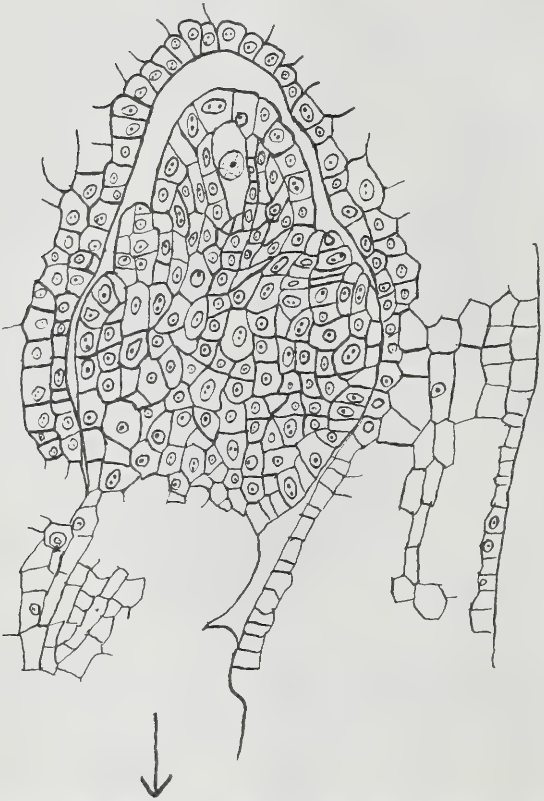

FIG. 3.—Slide 3*a*, 2/3, thickness 10 μ, fix. Navashin, stain: I—Hemat. + Fast green, obj. 45. oc. 5.
Macrospore mother cell.

upwards to the bend, finally towards the chalaza, as is typical for an anatropous ovule. This first kind of bundle supply to the ovule is certainly common in anatropous ovules but there are ovaries with the second condition, in which the bundle supply enters the ovule at the place of fusion of the chalaza with the carpel.

The ovule in *H. aristatus* is bitegmic and crassinucellate. The nucellus develops a very conspicuous epidermis (Fig. 12) with the cells anticlinally elongated. The cells of this epidermis are longest and biggest at the micropyle.

MACROSPOROGENESIS, EMBRYO SAC DEVELOPMENT AND FERTILIZATION

The initiation of the macrospore mother cell starts either in the layer just beneath the nucellar epidermis or in the next layer. In the ovule at this stage of development, the inner integument just reaches half the height of the nucellus and the outer integument 4–5 layers of cells beneath it has the appearance of a small protuberance. The epidermis of the nucellus still at a stage before its conspicuous differentiation differs slightly from the nucellus core. The formation of a parietal cell from an archesporial one was never observed with certainty. (Fig. 3).

Meiosis soon follows and dyads are formed when the integuments approach the top of the nucellus without as yet covering it (Fig. 4). The epidermal cells begin to elongate. Here and there some anticlinal and even periclinal divisions occur among them. Deviations from normal dyad and tetrad development were never observed. Tetrads are perfectly normal (Fig. 5).

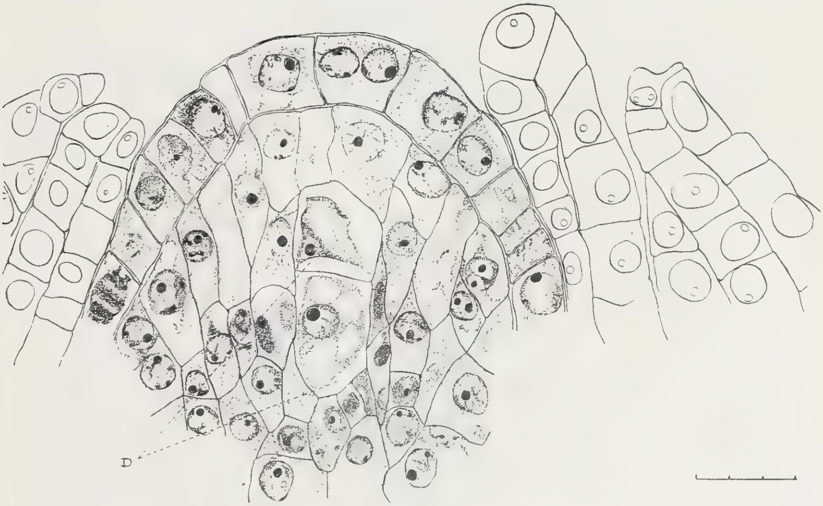

Fig. 4.—Slide 78, 1/8, thickness 12 μ, fix. F.A.A., stain: I—Hemat. + Fast green, imm. lens 98, oc. 10, magnif. 1400.
Dyads.

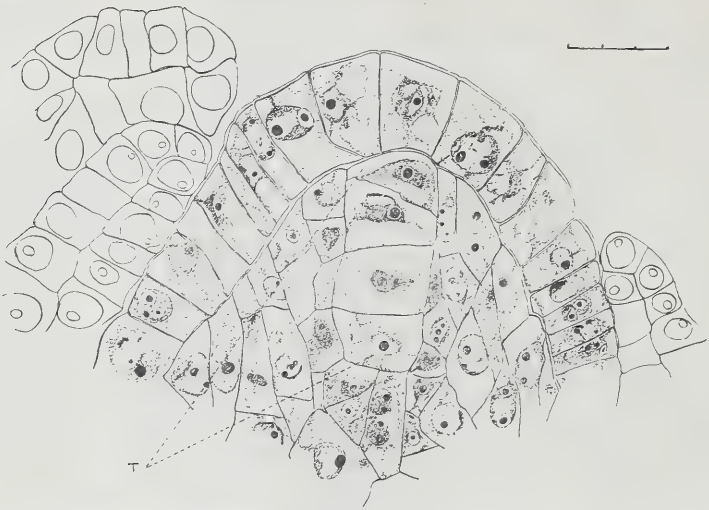

FIG. 5.—Slide 71, 2/4, thickness 12 μ, fix. F.A.A., stain: I—Hemat. + Fast green fl. imm. lens 98, oc. 10, magnif. 1400.
Tetrads.

The uninucleate or 1-nucleate embryo sac appears when the micropyle is nearly formed (Fig. 6). At this time the epidermal cells of the nucellus are elongating. Some of them still divide periclinally. Their nuclei are certainly bigger than the nuclei of nucellus cells. The embryo sac with two nuclei is a bit larger than the 1-nucleate stage. It has a large vacuole between the nuclei (Fig. 7).

The 4-nucleate embryo sac occurs when the micropyle is already formed (Fig. 8). The embryo sac cell is twice as large as in the 2-nucleate stage and the nuclei are perhaps the smallest encountered during the whole course of development of the embryo sac. It is worth noting that the outer integument is outgrowing the inner integument. In this species the sequence of integument development is as follows: the inner integument starts to develop first; the outer integument starts later but develops more quickly, so that in the 2-nucleate embryo sac they are both already approximately of equal height. At the stage of the 4-nucleate embryo sac the outer integument is taller. The 8-nucleate free nuclei stage is very rare. It is common knowledge that this stage is very short lasting. Here the nuclei of the embryo sac reach their smallest size. From this stage on they increase with the further growth of embryo sac and its differentiation. It was considered lucky to obtain one distinct slide of this stage out of about 260 slides of the embryo sac prepared (Fig. 9).

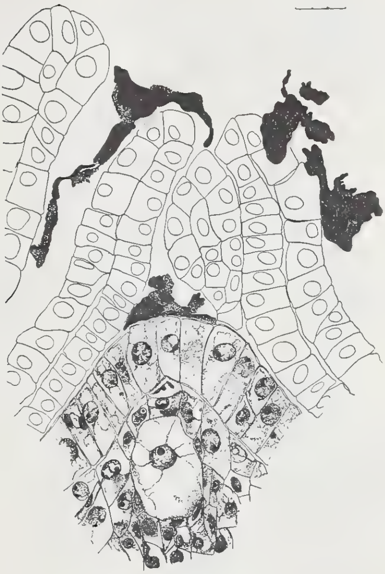

FIG. 6.—Fl. imm. lens 98, oc. 10, magnif. 1400.
1-nucleate embryo sac.

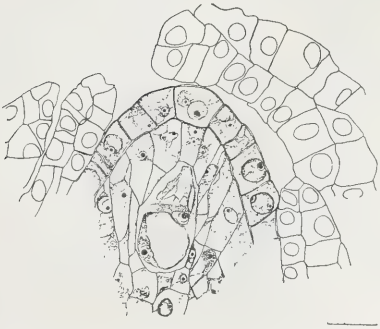

FIG. 7.—Slide 65, 3/2 thickness 12 μ, fix. F.A.A., H. Fl. 3 days, stain: crystal violet, fl. imm. lens 98, oc. 10, magnif. 1400.
2-nucleate em. sac.

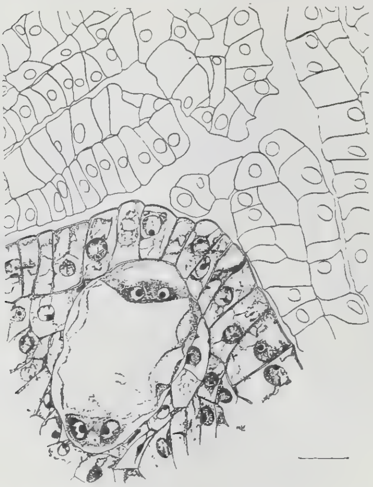

FIG. 8.—Slide 48, 1/last, thickness 8 μ, fix. F.A.A., H. Fl. ac. 3 days, stain: I—Hemat. + Fast green, fl. imm. lens 98, oc. 10, magnif. 1400, compound drawing. 4-nucleate em. sac.

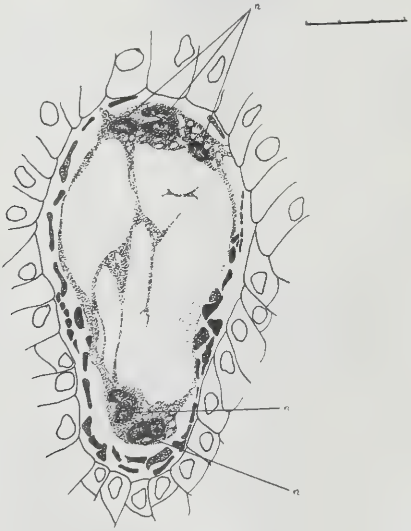

FIG. 9.—Slide 117, 1/6–7, thickness 12 μ, fix. Nav., stain: Feulgen, Ph. oil imm. lens 100, oc. 10, magnif. 1300.
8 free nuclei stage in em. sac.

The mature embryo sac has a typical egg apparatus: egg cell and two synergids (Fig. 10). In the majority of the observed embryo sacs the big vacuole of the egg cells is above the nucleus and in the synergids is below it. The synergids when first formed look like those in Fig. 10.

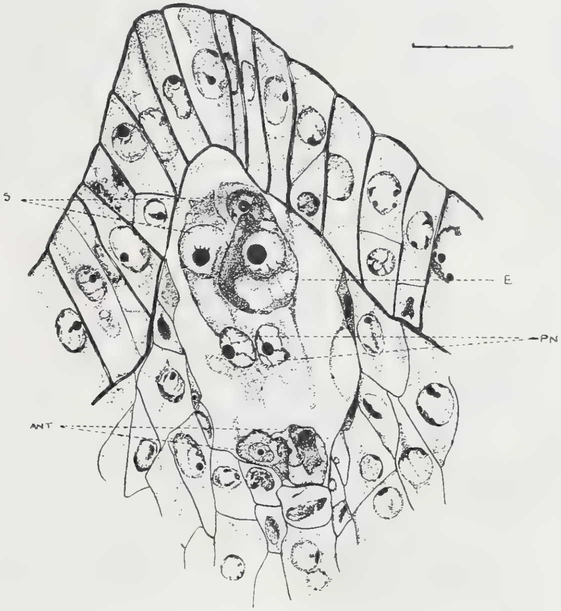

Fig. 10.—Slide 61*b*, 3/1, 3/2, thickness 15 μ, fix. Nav., H. Fl. ac. 3 days, stain: I—Hemat. + Fast Green, fl. imm. lens 98, oc. 10, magnif. 1400. Mature em. sac.

Later, with the increasing age of the embryo sac, the synergids develop hooks. In some embryo sacs which were apparently overmatured (without fertilization), but before their degeneration, the synergids had distinct hooks and a filiform apparatus.

The polar nuclei are suspended in the cytoplasm of the embryo sac very close to the egg apparatus. The three antipodals persist, sometimes even until the moment of fertilization of the secondary nucleus. Sometimes they begin degenerating before this stage. The antipodals, contrary to our findings in *Restio Doddii*, and in *Elegia racemosa* (Borwein *et al.*[2]), never divide.

The polar nuclei fuse late. They are often seen to be lying in contact when the male nucleus approaches them. In median section, the mature embryo sac before fertilization has the shape of an octagon with the micropyle-chalaza axis being much longer than the axis perpendicular to it. It increases in size considerably during the maturation period. The epidermis of the nucellus now reaches full development. Some lignification of the epidermal walls appears during the time of syngamy. It follows from the above findings that the embryo sac in *H. aristatus* is monosporic of the Polygonum type.

The most outstanding feature of the mature embryo sac is that fertilization in it occurs very seldom. A very large proportion of the embryo sacs degenerate without fertilization. In those fertilized the remains of the pollen grain tube in the micropyle are very soon resorbed. Embryo sacs at the 4-nucleate stage of the endosperm, and without any pollen grain tube remains in the tissue, are very frequently encountered. Unfortunately no clear picture of the sperms on their way to the female gametes

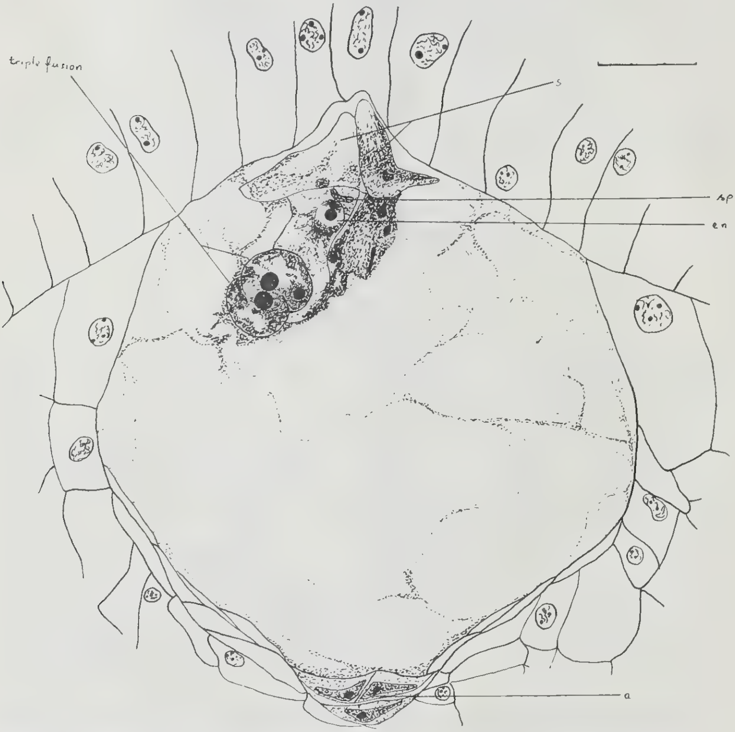

FIG. 11.—Slide 219, 2/1–4, thickness 12 μ, fix. Nav., stain: crystal violet, Ph. oil imm. 100, oc. 8, magnif. 1600, compound drawing.
Double fertilization in em. sac.

was found. Usually there were stages of late syngamy with many endosperm nuclei in the embryo sac cytoplasm. Fig. 11 represents the earliest fertilization stage found.

The polar nuclei are here in advanced fusion with the male nucleus. The second sperm (Fig. 11—sp.) is just touching the egg cell nucleus. The synergids display their hooks. At the bottom of the embryo sac the already reduced but still distinct antipodals may be seen. In this material it is rather an early stage. In the slides, stages of delayed syngamy in the egg cell and advanced development of endosperm prevailed. The proembryo stage was never seen in the course of the present investigation. Even the mature zygote (Fig. 12) was rare. The one in Fig. 12 also

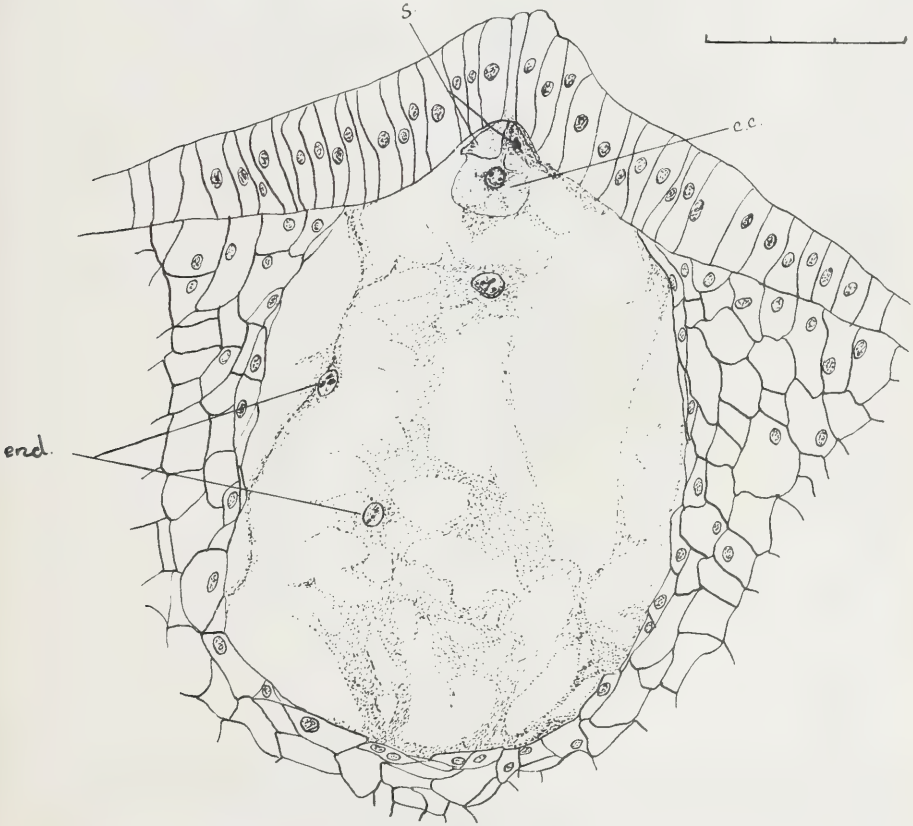

FIG. 12.—Slide 206, 2/3—2/5, fix. F.A.A., stain: Feulgen + L. green, Ph. obj. 20, oc. 8, magnif. 375, compound drawing.
Young zygote, endosperm nuclei. ec–young zygote

seemed exceptional, because of the fact that syngamy was accomplished when only three nuclei of the endosperm were formed. The most frequent stage found (Fig. 13) was that of belated syngamy in the egg and in many nuclei of the endosperm.

In one embryo sac 16 free nuclei were found in the endosperm and in the egg cell the fusion of the male nucleus with the female one was still not accomplished. It was certainly not a matter of chance only but a very significant feature and probably relevant to the tendency to produce some fruits with undeveloped embryos.

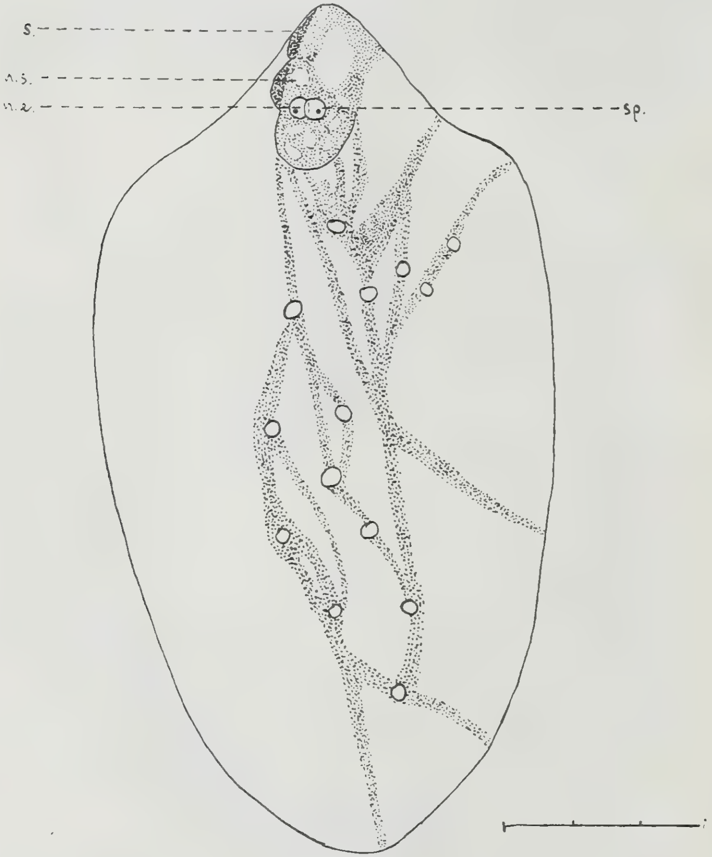

FIG. 13.—Slide 150, 2/1–3, thickness 14 μ, fix. Nav., stain: Feulgen + L-green, obj. 40, oc. 12, magnif. 600, compound drawing, schematically.
Belated syngamy in egg. 14 endosperm nuclei.
s—synergid, n.s.—synergid nucleus, n.e.—egg. nucleus, sp.—sperm.

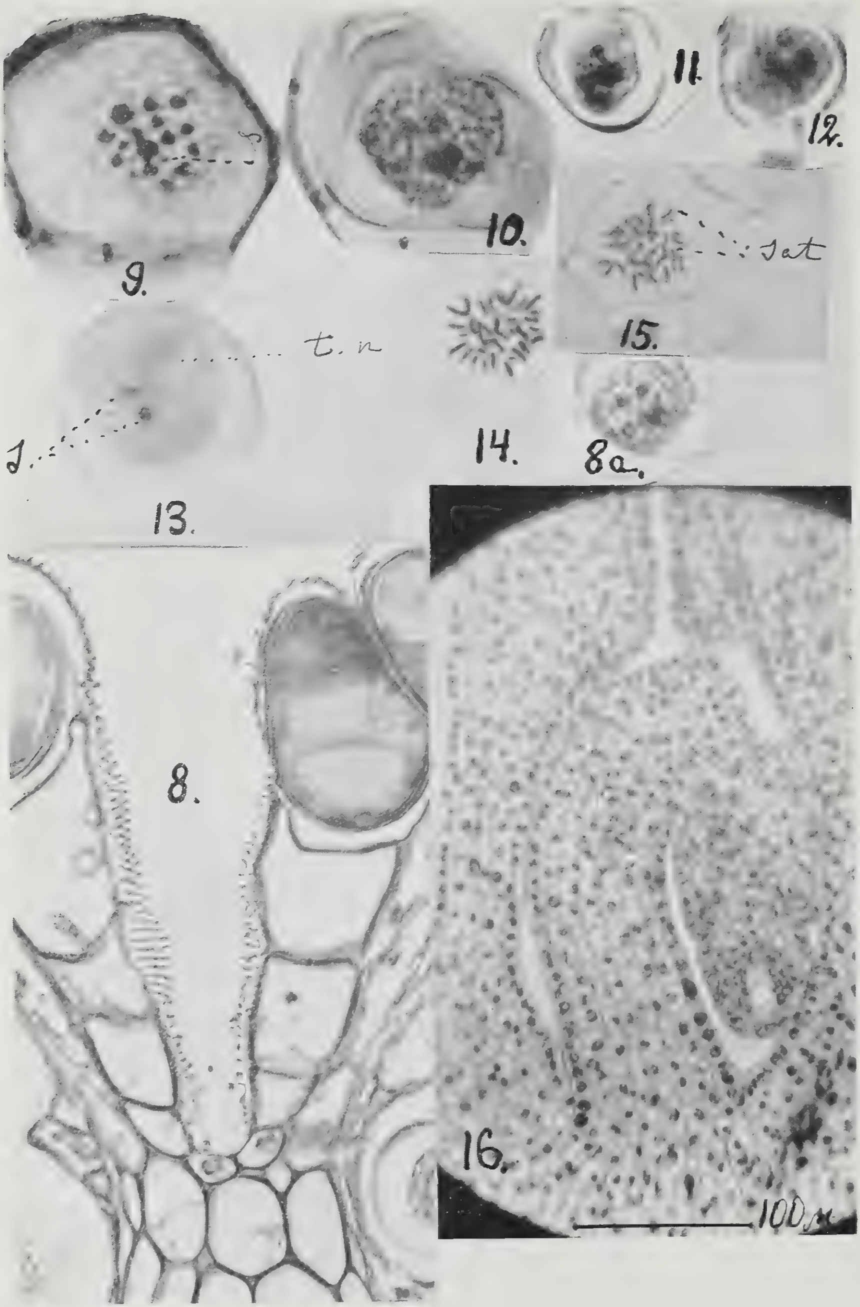

Plate IV

THE ANTHER STRUCTURE, POLLEN GRAIN DEVELOPMENT AND MEIOTIC CHROMOSOME NUMBERS

All members of the Restionaceae are dioecious. The male floret of *Hypodiscus aristatus* has six scales in the perianth and three stamens. The anthers here have only two loculi (pollen grain sacs). The structure of the anther wall and the relationship of the anther to the filament are not yet described. The youngest stage encountered in this investigation corresponds to the early meiotic prophase in pollen grain mother cells (Plate III, Fig. 6). Here, the anther wall is built of four layers. The epidermis, still very distinct, starts to store some tannins. The next layer, the endothecium, is still very young, containing cytoplasm and nuclei. The transitional layer is already slightly depressed. The most internal layer, the tapetum, shows the cells in full vigour, filled with the cytoplasm and nuclei. Some of the tapetal cells are already binucleated.

PLATE IV

FIG. 8.—Slide A, thickness 10 μ, taken with Bausch & Lomb fluorite imm. 98, oc. 10, magnif. about 1000.

Part of the anther, with the thinnest portion of the wall shown, where opening occurs. Hair-like cutinisation of the epidermis. Connective.

Mature pollen grain.

FIG. 8^a, one mature pollen grain from the above photo enlarged and separated to show 4 nuclei in it.

FIG. 9.—Slide 22^b, 4/4, fix. F.A.A., stain: pur. crystal violet, thickness 12 μ, taken with Bausch & Lomb fluorite oil imm. 98, oc. 10, magnif. 1000.

Pollen grain mother cell, meiotic metaphase I, $n = 16 + 1$ satellite.

FIG. 10.—Slide A, stain: I—Hemat. + Fast green, taken with fluorite oil imm. 98, oc. 10. Yellow filter No. 15, exposure 6 in. magnif. about 1000.

Three-nucleate pollen grain.

FIG. 11.—Slide 17, stain: I—Hemat. + Fast green, obj. 60, oc. 10, magnif. about 600.

Four-nucleate pollen grain.

FIG. 12.—As above.

Five-nucleate pollen grain.

FIG. 13.—Slide 30 E_4, left mark, lower row, fix. Ac. Alc., stain: Feulgen, fluorite oil imm. 98, oc. 10, exposure 18 in., high contrasted filter, magnif. about 1100.

S—sperm nuclei.

T.N.—unstained tube nucleus.

FIG. 14.—Slide D_4, 3/2, at 3^h, 8th cell f. epiderm. stain: pur. crystal violet, taken with fluorite oil imm. 98, Bausch & Lomb, oc. 10, exposure 9 in., filters—green and ground glass, magnif. about 1300.

Root tips from the male plant. $2n = 32$.

FIG. 15.—Slide D., 2/7, at 10^h, 5th cell from epiderm., taken with Bausch & Lomb fluorite oil imm. 98, oc. 10, exposure 9 in., 2 filters, magnif. 1100, as above. Both satellites are distinct.

Sat—satellites.

FIG. 16, slide 4, 1/3, B & L, obj. 45, oc. 5, magnif. 250.

Orthotropous condition of the ovule in an even later stage, when the micropyle is formed and beginning of the embr. sac initiated.

At the stage of dyads and tetrads the anther wall shows distinct tapetal cells in the process of absorption, the remains of transitional layers, the endothecium or mechanical layer (not yet fully developed) and the epidermis, already charged heavily with tannins. The tannins here are so persistent that even a week's treatment in Stockwell solution, or in 1% Chromic acid, does not wash them out at all.

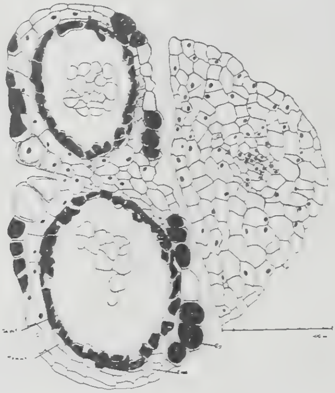

FIG. 15.—Slide 6, penultimate section in 2nd row, thickness 12 μ, fix. F.A.A., stain: I—Hemat + Fast green, obj. 15, oc. 10, photo enlargement 150. Anther free of filament. Dyads, tetrads.

Fig. 15 represents a cross section through the upper part of the anther and the filament. The filament here has one trace and it is free of the anther. At a lower level the filament is fused completely to the connective and to the anther (Plate III, Fig. 7).

At the stage represented in Plate III, Fig. 7, the cells of the tapetum have already disappeared leaving only a line of grains. The epidermis has increased in cell size. The biggest change has occurred in the endothecium. Its cells have developed spirals stained distinctly with safranin. They represent the opening mechanism of the wall. This structure of the wall reminds one of the Lilium anther structure. Fig. 14 illustrates the mature and opened anther. One can see that wall breakage occurs in its inner corner, again similarly to the genus Lilium. This part of the wall has a complex of very thin cells in the endothecium and in the epidermis. This is the place of the smallest resistance to tension and adapted to easy breakage. In the same area one can see under higher magnification (Plate IV, Fig. 8*a*) that epidermal cells reveal a peculiar ornamental structure—cutinised teeth on the outer wall.

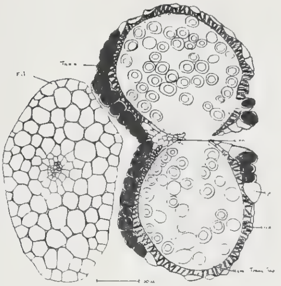

Fig. 14.—Slide A5, 2nd row, thickness 20 μ, fix. F.A.A., stain: Safr. + Fast green, obj. 10, oc. 15, magnif. 200–220. 50–55.
Mature anther. Opening.
Mature endothecium.

One finds therefore two non-cellulosic structures in the anther wall of *Hypodiscus aristatus*: (*a*) the lignified spirals of the mature endothecium, (*b*) cutinised teeth of the epidermis.

To summarise the findings of this section: The young anther has a 4-layered wall. The mature anther has an endothecium with spirals and opens at a distinctive thin region at the inner corner (as in the genus Lilium, but not as in Gramineae).

The cytokinesis in the pollen grain mother cells is of the successive type. There are no abnormalities in formation of dyads and tetrads. The meiotic metaphase I was often observed. It comes out especially well after Newton's crystal violet stain. It shows 16 bivalents and one satellite (Plate IV, Fig. 9). Few metaphases have n = 15. The prevailing number was certainly 16.

The morphology of the pollen grains of some members of the Restionaceae has already been described by Erdtmann[5]. The mature pollen grain is loaded with starch. After staining with iron-hematoxylin or aceto-carmine it has one large tube nucleus and two very small male nuclei, the so-called sperms (Plate IV, Figs. 10 and 13). The size of these male nuclei measured in the five best pollen grains, which had been stained by the Feulgen method, was: width—minimum $0 \cdot 8$ μ, maximum—$1 \cdot 6$ μ, length—minimum $3 \cdot 0$ μ, maximum—$4 \cdot 5$ μ. With the technique used in the present work it was impossible to reveal any trace of male cytoplasm around them. The great majority (probably 85%) of slides showed 3 nuclei in the pollen grains.

Hypodiscus aristatus in this respect is very similar to the Gramineae and Juncaceae in which the 3-nucleate condition is typical for the family. Besides the prevailing 3-nucleate condition in *H. aristatus* some pollen grains with 2 nuclei occur and exceptionally some with 4 nuclei (Plate IV, Fig. 11 and 8*a*) and even, rarely, with 5 nuclei (Plate IV, Fig. 12).

In the slides from material fixed in acetic-alcohol and stained by the Feulgen method, the mature pollen grain shows two sperms stained well with Feulgen and a completely unstained tube nucleus. To check findings, some sections of the same anther were divided between two slides; one was stained with iron-haematoxylin, another by the Feulgen method. In the first one three nuclei were stained: the tube nucleus and two sperms. The second slide shows only two sperms stained red and the tube nucleus unstained. Comparing these results obtained after different staining, one can only come to the following conclusion: the tube nucleus in the mature pollen grain of *H. aristatus* is completely deprived of D.N.A., and therefore it is not stained by the Feulgen method. But it has a lot of nucleoproteins and that is why it is stained with iron-haematoxylin and aceto-carmine. D.N.A. deficiency in the tube nucleus is generally not a new finding, but it is a new fact for the Restionaceae. The above observations were based on the material collected in 1950 only. Then I asked my botanist colleague in Cape Town, Miss du Plessis, to collect and fix in acetic alcohol fresh material in July–August 1956. Slides prepared from this fresh material, and stained by the Feulgen method, completely confirmed the first conclusion: the small sperm nuclei in mature pollen grains have D.N.A. and the big tube nucleus lacks it completely (Plate IV, Fig. 13).

It is certain now that deficiency in D.N.A. in the tube nucleus is not dependent on the season (year) of collection.

La Cour[9], reported such instances some years ago, but for tube nuclei in pollen grain tubes. Bryant[3], recently opposed this interpretation of tube nuclei in Tradescantia.

Present findings evidently support La Cour's observations. In view of these findings of D.N.A. deficiency in the tube nucleus, one can now interpret the origin of the supernumerary nuclei in pollen grains, namely those with 4 and 5 nuclei. The supernumerary nuclei were all found after staining with iron haematoxylin and aceto-carmine. To date no supernumerary nuclei have been found in the slides stained with the Feulgen method. It proves that supernumerary nuclei have the same nature as the tube nuclei. In view of this, and until such should be found with Feulgen staining, it is safer to assume that the supernumerary nuclei are the products of division of the tube nucleus or the results of its degenerate fragmentation.

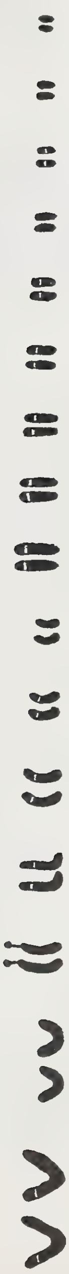

Fig. 16.—Reichert's fluorite imm. lens 100, oc. 17. magnif. 2600. Idiogram of chromosome set of the female plant.

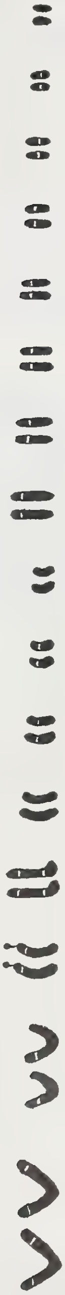

Fig. 17.—Optics as above. Idiogram of chromosome set of the male plant.

DIPLOID CHROMOSOME NUMBER, IDIOGRAMS OF CHROMOSOMES AND SOME ANATOMICAL PECULIARITIES OF ADVENTITIOUS ROOT STRUCTURE

Investigation of root tips of adventitious roots was as usual a good source of somatic metaphases. First it was found that the diploid number of chromosomes was 32 in the roots of male plants. There were two satellites (Plate IV, 14 and 15 and Fi. 19). Contrary to our first expectation (Krupko, 1957), there was no difference between the two SAT-chromosomes. Comparing many metaphases of both male and female plants the morphological equality of both SAT-chromosomes was established. There was slight variation in weakly marked bending of the chromosomes in both sexes (Figs. 18 and 19).

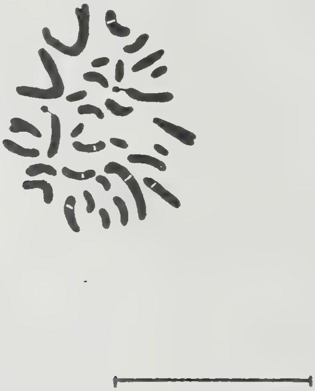

Fig. 18.—Slide A, 3/8, thickness 8 μ, fix. Navashin, stain: I—Hemat., optics as Fig. 19.
Female plant. Metaphase from root tip. Two satellites.

An idiogram was drawn for the male chromosome set from ten selected metaphases. One can easily distinguish amongst them: 2 V-shaped pairs, 1 SAT pair, 1 L-shaped pair, 4 pairs slightly curved in the middle, 8 rod-shaped pairs of different lengths. An idiogram of the chromosomes of the female plant was drawn in the same way (Fig. 16). Complete similarity in chromosome sets of both sexes was found. The female plant chromosomes have the same diploid number = 32, and the same chromosome morphology as the male plant. Such a perfect similarity

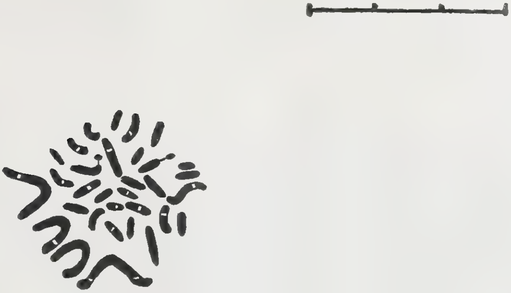

Fig. 19.—Slide D3, 1/7, thickness 10 μ, fix. Navashin, stain: pur. Cr. Viol., Reichert's fluorite oil imm. lens 100, oc. 17, magnif. 2600.
Male plant. Metaphase from root tip. Two satellites.

was rather unexpected because the male plants differ from female ones in shape of the inflorescences. The only minute difference one may find is shown by the female plant: its chromosomes are perhaps slightly wider.

On cutting more mature parts of the same roots in the male and female plants it was found that the pericycle here is formed of many cell layers, usually 6–8 (Fig. 20).

This feature deserves to be noted and published, because a pericycle of many layers is a distinctive character of Gymnosperms. In Angiosperms it is only found in a few exceptional plants. For example Esau's "Plant Anatomy"[5a] gives only 6 such exceptional plants. A many-layered pericycle was, however, recorded from some Restionaceae species by Solereder and Meyer "Systematische Anatomie der Monokotyledonen" H. IV, 1929, p. IV. 29. The following species were mentioned as having a large pericycle: *Leptocarpus incurvatus*, *Restio triflorus*, *Thamnochortus fruticosus*, and *Hypodiscus willdenowia*. To that list we can now add *Hypodiscus aristatus*.

Other species of Restionaceae have narrow, 1-layered pericycles, typical for Angiosperms.

DISCUSSION

The value of the type of ovule for taxonomy and evolution was a much discussed subject in the literature. The orthotropous ovule is usually recognised as a primitive character. From this point of view, the Restionaceae have a distinctly primitive feature as compared with the order

Liliiflorae with an anatropous ovule—an advanced character. In this respect *H. aristatus* would differ from other Restionaceae in not having a purely orthotropous ovule but one initially starting from an anatropous stage. This feature places *H. aristatus* much nearer to the Liliiflorae than other members of the family.

Another character in common with the Liliiflorae in *H. aristatus* is the persistence of the antipodals in embryo sac development. In *Restio dodii* and *Elegia racemosa*[2] the antipodals form a complex of cells similar to that in the Gramineae. In *H. aristatus* the antipodals never divide but are long lasting elements of the embryo sac. The wall of the anther and its opening mechanism are reminiscent of similar structures in many Liliaceae.

Hutchinson's recent opinion[7] is that Restionaceae should be classified in common with Juncaceae, Thurniaceae, and Centrolepidaceae in the new order, Juncales. Inside this order Restionaceae are the nearest to Juncaceae and both originate from the Liliiflorae. This new order of Juncales in Hutchinson's system is a part of Division III, Glumiflorae together with Cyperales and Graminales. The embryology of Juncales is only a little better known than the embryology of the old order Enantioblastae in which the Restionaceae were usually included in previous systems. From this scarce information it is known the Juncaceae develop 3-nucleated pollen grains in tetrads (Schürhoff[16]). *Hypodiscus aristatus* has single and 3-nucleated pollen grains. Thus this species differs from Juncaceae and is rather similar to Gramineae with 3-nucleated single pollen grains present as a rule. The tendency to develop 3 nuclei in mature pollen grains was observed previously in other members of Enantioblastae (Weinzieher[20]), who reported it long ago in *Xyris indica*; and Palm[12] in *Eriocaulon septangulare*. Perhaps one must be cautious in any assumption based on embryological facts in the Restionaceae, having in mind the small number of species investigated (only three amongst more than three hundred known and described). Embryological knowledge of the order Enantioblastae is no better (see Maheswari[10]). Few species have been studied. Perhaps the best known is the genus Tradescantia. Embryological studies of Juncaceae have progressed only slightly further. It follows from the above that it is too early to make any conjectures about relationships and the taxonomic position of Restionaceae on the basis of embryological and cytological characters.

With our present knowledge one can only trace the affinities of the three species of Restionaceae studied. *Restio dodii* and *Elegia racemosa* have affinity to the Gramineae in that they develop numerous antipodals, but they differ from Gramineae and Liliiflorae generally in the possession of a true orthotropous ovule. *Hypodiscus aristatus,* displaying an anatropous stage in ovule development shows affinity to the Liliiflorae

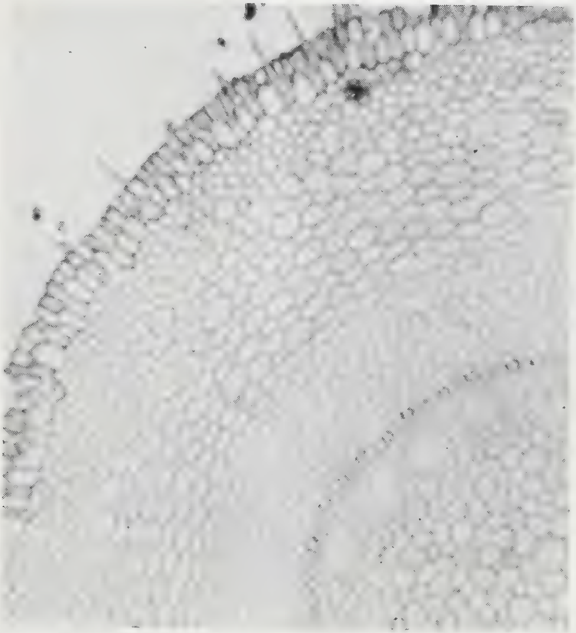

Fig. 20.—Slide Ng B7, adv. root, thickness 20 μ, fix. Navashin, stain: Safr. + Fast green, obj. 10, oc. 10, photo enlargement 110.

Male plant. Transect. adv. root showing pericycle many layers thick.
end.—endoderm.
per.—pericycle.

and Juncaceae. Other links with these groups are the three persistent antipodals, the opening mechanism in the anther and the strong 4-layered structure of the anther wall. *H. aristatus* differs from Juncaceae and other Liliiflorae in the structure of the mature pollen grain since a 3-nucleate, single pollen grain is certainly a feature much nearer to Gramineae.

To end this comparison it might be well to recall the primitive character in the root structure of *Hypodiscus aristatus.* It has a pericycle many layers thick, which is a character typical for Gymnosperms, especially for Coniferales. The fact that *H. aristatus* is the fifth species in the family with this character, certainly speaks for the primitive nature of the family.

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SOUTH AFRICAN IRIDACEAE. THE GENUS *IXIA.*

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ABSTRACT

The genus *Ixia* (Iridaceae), endemic to the Cape Province, is revised. The reason for proclaiming the name a nomen conservandum in 1935 is explained in an outline of the history of the genus. Forty-four species and twenty varieties are described, the majority of the varieties and eight of the species new. *Tritonia* subgenus *Dichone,* now transferred to *Ixia* as a subgenus, contains eight species, two of them new and two transferred here from the subgenus *Ixia.* In the subgenus *Ixia,* with thirty-six species, three of the four sections previously established are upheld. Keys to the subgenera, sections and species are provided, six species and one variety are figured and there is a brief note on geographical distribution. To facilitate reference to numerous changes made in connection with a number of species belonging to *Ixia* and other genera, a list of all names published under *Ixia* since 1753 is given in an appendix.

INTRODUCTION

This attractive genus of the Iridaceae, endemic to the Cape Province, was introduced into gardens in England and Europe two hundred or more years ago, and the number of illustrations of various species which appeared in botanical and horticultural works of the second half of the eighteenth and early part of the nineteenth centuries give evidence of the popularity of these plants during that period. Unfortunately, as happened in most genera of the South African Iridaceae, several of the better known species soon became involved in misidentifications and considerable confusion, much of which has persisted to this day.

The need for some clarification was expressed as early as 1794 when the editor of Curtis's Botanical Magazine, under t. 256, a figure of *Ixia longiflora* (= *I. paniculata*), wrote as follows: "We are not acquainted with a tribe of plants which stand more in need of elucidation than those of this genus; of the vast number imported from the Cape within these few years, where they are chiefly natives, few comparatively are well ascertained; some of them appear subject to great variation, both in the size and colour of their blossoms (whether in their wild state they are thus inconstant, or whether these are seminal varieties raised by the persevering industry of the Dutch florists, we have not yet had it in our power satisfactorily to ascertain)".

After studying the plants in the field for several years I can now answer the questions raised by Curtis, for I have found that there is a great deal of variation not only in the size and colouring of the flowers but also in the size of the whole plant. He was also right in suspecting that some of the plants imported from Holland were hybrids as many of the species are known to hybridize readily and there is no doubt that a large number of hybrids were produced in Europe at that time, as for example almost all of those figured by Jacquin in 1797 as varieties of *I. maculata*, on plates 21 and 22 of his Hortus Schoenbrunniensis.

At the time when Curtis wrote, the genus *Ixia* comprised members of at least nine different genera, i.e. *Ixia*, *Hesperantha*, *Geissorrhiza*, *Sparaxis*, *Tritonia*, *Dierama*, *Synnotia*, etc., but although the genus, as defined and understood to-day, is no longer the "tribe of plants" referred to by him, it is still as much in need of revision as it was in 1794. The last account to appear, that of Baker in the sixth volume of the Flora Capensis, published in 1896, remains the standard work for lack of any other, though it is out of date, inaccurate, and contains a number of misidentifications and mistakes in the nomenclature. Of the twenty-three species he placed in the genus, four have since been found to belong to other genera, while the main characters which he used for distinguishing the species, namely the size and colour of the flowers, have proved to be unreliable since both are subject to so much variation.

In undertaking a revision of the genus I have come up against several problems in the nomenclature and taxonomy, and in trying to solve some of the involved problems in the former I have to some extent been handicapped by not having access to certain botanical works not available in this country, as well as by not having seen a few of the types.

The difficulties encountered by anyone dealing with the Iridaceae, and *Ixia* in particular, were pointed out by Ker in 1802 when he wrote as follows in the Botanical Magazine, under a figure of *I. capillaris* (t. 570): "Throughout this natural order, in which the different species and genera slide imperceptibly into one another, it is often impossible to mark the exact limits of each, and the means adopted by different authors will be found perpetually inadequate to the task. Thus the relative proportion of the tube to the spathe and of the border (lobes) to the tube, though sometimes material, often afford no ground whatever for specific distinction, even differing in different years in the same plant." This variability and lack of stable demarcation between some of the species must inevitably result in a difference of opinion among botanists on the concept of some of them. A knowledge of the plants in their natural habitat has largely aided and influenced me in my treatment of some of these controversial species.

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Bolus Herbarium, University of Cape Town	BOL
Department of Botany, University of Cape Town	CT
Compton Herbarium, National Botanic Gardens, Kirstenbosch	NBG
South African Museum Herbarium, National Botanic Gardens, Kirstenbosch	SAM
National Herbarium, Pretoria	PRE
Royal Botanic Gardens, Kew	K
British Museum (Natural History)	BM
Linnaean Society, London	LINN
Naturhistoriska Riksmuseet, Stockholm	S
Botanical Gardens and Museum, Uppsala	UPS
Conservatoire et Jardin Botaniques, Geneva	G
Botanische Garten und Museum der Universität, Zürich	Z
Botanische Staatssammlung, München	M
Botanisches Museum, Berlin-Dahlem	B
National Natural History Museum, Paris	P
Jardin Botanique de l'Etat, Bruxelles	BR
Rijksherbarium, Leiden	L

The collections of the majority of these institutions were sent here on loan and I have to thank the Directors and Curators of those concerned for their kind co-operation in rendering this service. *Ixia* material in the British Museum, the Linnaean Society, the Natural History Museum, Paris, the Herb. Delessert, Geneva and Thunberg's Herbarium in Uppsala, was examined during a visit to England and Europe in 1949, and I am grateful to the Directors and Curators for the facilities provided and the assistance I received at that time.

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HISTORICAL NOTE

The following brief outline of the history of the genus *Ixia* will give some idea of the confusion in which it has been involved and the various treatments it has received from the time of its inception until 1935, when the name *Ixia* was declared a *nomen conservandum.*

The first two species of *Ixia* described in the Species Plantarum by Linnaeus in 1753 do not belong to the genus as understood to-day, one being *Aristea africana* and the other *Belamcanda chinensis.* In the second edition of the "Species Plantarum", published nine years later, Linnaeus retained the two species previously described and added eight more (one in the appendix), but though half of these are species of *Ixia* the others belong to four different genera, namely *Romulea*, *Lapeirousia*, *Sparaxis* and *Tritonia.* During the next thirty to forty years a great many more species were described by the botanists De la Roche, Burmann f., Linnaeus f., Thunberg, Jacquin and others, but comparatively few of them are Ixias, the majority belonging to the genera mentioned above as well as to *Geissorrhiza*, *Hesperantha*, *Babiana*, *Synnotia*, *Dierama* and two or three other genera. However, it was soon recognized by various authors that these could not all be classed together and towards the end of the century and in the early part of the nineteenth century, one after the other, most of the genera named above were segregated and established as separate genera with many of the species belonging to them removed from *Ixia.*

Ixia was thus gradually reduced and the generic name, instead of being widely used for a large and heterogeneous collection of species, came to be more or less generally accepted for a small and fairly well circumscribed group of plants, most of which are now recognized as belonging to the genus *Ixia.* According to the modern rules of botanical nomenclature the use of the generic name for this group is not correct as the first two species described by Linnaeus were later excluded from the genus, but to avoid further confusion it was agreed at the 1935 International Botanical Congress that the name should be conserved, and that the genus be treated as having originated in 1762 in the second edition of Linnaeus' Species Plantarum, in part, as emended by Ker in 1804 in Koenig and Sims' Annals of Botany (excluding the species), and by Baker in 1877 in the "Journal of the Linnaean Society". It was agreed also that the type species should be *I. polystachya* L.

From 1762 on, the genus received various treatments by different authors and has undergone several changes. Some of the species have, at one time or another, been placed in genera other than *Ixia,* and one species in particular, the long-tubed *I. paniculata,* has been associated with no less than eight different generic names. It was originally named *I. paniculata* by De la Roche when he described and figured it in 1766. Fourteen years later a description and figure were published by Houttuyn, named by him *Houttuynia capensis,* but this figure was misinterpreted by Ker in 1803 and as a result *Houttuynia* Houtt. was placed as a synonym of *Acidanthera* instead of *Ixia.* The error was pointed out by Merrill in 1938 (Journ. Arn. Arb. 19: 328), when he wrote as follows:

"In the 'Botanical Magazine', 17: t. 618. 1803, Ker-Gawler illustrated and described a plant as *Tritonia capensis* which he based nomenclaturally on *Houttuynia capensis* Houtt. The plant he illustrated is *Acidanthera capensis* Benth.; Baker in Thiselton-Dyer, Fl. Cap. 6: 133. 1896. As a result of Ker-Gawler's misinterpretation of Houttuyn's species, the genus *Houttuynia* Houtt. is erroneously placed as a synonym of *Acidanthera* Hochstetter, although it seems manifestly to appertain to *Ixia. Houttuynia* Houtt. (1780) has priority over *Houttuynia* Thunb. (1784), but as the latter name is in general use for a very different group of plants in the Saururaceae it seems desirable to conserve the saururaceous *Houttuynia* Thunb. . . ." (N.B. This was done at the International Botanical Congress in Paris in 1954).

"Not being able to solve the problem of the identity of *Houttuynia capensis* Houtt. to my satisfaction, an appeal was made to Dr. R. H. Compton at Kirstenbosch. He states that Miss Barker who investigated the matter reports that in her opinion the 'Botanical Magazine' plates 618 and 1531 (*Tritonia capensis* Ker-Gawler = *Acidanthera capensis* Benth.) do not represent the same species as that figured by Houttuyn. And that Houttuyn's illustration is a much better match for *Ixia paniculata* De la Roche, a species that occurs in the Cape Peninsula, and which has a regular flower with very short bracts. . . . Miss Barker's findings were confirmed by Miss G. J. Lewis."

In 1812 the generic name *Hyalis* Salisb. was published, in association with four species of *Ixia,* but as Salisbury supplied no generic description the name *Hyalis* is a *nomen nudum.* Baker cited *Hyalis* Salisb. as a synonym of *Morphixia* Ker in his Systema Iridacearum in 1877 (Journ. Linn. Soc. Bot. 16: 96), but he later adopted Salisbury's name for a subgenus of *Ixia,* with a very brief diagnosis (Handbk. Irid. 161 (1892) and Fl. Cap. 6: 77 (1896)).

The genus *Morphixia* was founded by Ker in 1827 (Gen. Irid. 105) to contain four species of *Ixia* with a campanulate or funnel-shaped perianth tube, thereby distinguished from *Ixia* in which the perianth tube is slender and cylindrical. Baker described three new species of *Morphixia* in 1876, and in his Systema Iridacearum, published the following year, he upheld *Morphixia* as a genus, and listed nine species, but in his Handbook of the Iridaceae and the Flora Capensis he reduced it to a subgenus of *Ixia* and transferred some of the nine species to the subgenus *Hyalis*, and one of them to the genus *Watsonia*. It has since been found that five of these nine species belong to five different genera.

Klatt, in 1882, also upheld *Morphixia* as a genus though his treatment differed somewhat from that of Baker. He gave as a synonym *Hyalis* Salisb., but transferred to *Morphixia* the species of *Ixia* with connate filaments (i.e. *I. monadelpha* and *I. curta*) and by raising to specific status some of the varieties of *I. columnaris* (= *I. monadelpha*) figured by Andrews, he brought the number of species in *Morphixia* to fifteen. Baker considered the various varieties figured by Andrews to be forms of *I. monadelpha* (with which I agree), but placed this species as the only one in a separate subgenus, *Eurydice* (due to a typographic error spelt *Euryolice* in the Flora Capensis), adopting the name used by Persoon in 1805 (Syn. 1: 48) for a section of *Ixia* distinguished by having connate filaments.

Another generic name which enters into the history of *Ixia* is *Freesea*, published by Ecklon in 1827 in his Topographisches Verzeichniss (p. 30), but as he gave no generic description it is a *nomen nudum*—it is not the same as the well-known genus *Freesia* Klatt. Ecklon associated five species with *Freesea*, four of which are at present placed in *Tritonia*, but one is *Ixia paniculata* De la R., i.e. *Freesea longiflora* Eckl. (syn. *Tritonia longiflora* Ker).

Two other names which should be mentioned are *Waitzia* Reichb. and *Wuerthia* Regel. The former. published by Reichenbach in 1828 (Consp. 60) is not legitimate as Wendland had used the name ten years earlier for a genus of Compositae, but in 1840 Heynbold made several illegitimate new combinations with *Waitzia* Reichb. (Nomen. 1: 854), among them *W. concolor*, *W. longiflora*, *W. tenuiflora* and *W. rochensis*, based on *Tritonia concolor*, *T. longiflora*, *T. tenuiflora* and *T. rochensis*. The first three are all synonyms of *Ixia paniculata* De la R. (see note under that species), and the last a synonym of *I. bellendenii* Foster, a new name given to this species in 1936.

Wuerthia Regel was published in 1851 (Bot. Zeit. 9: 595), with a single species, *W. elegans*. I have not seen the original description or type but the plant figured two years later as *W. elegans* (Gartenfl. 98: t. 46. f. 2) is an *Ixia*, probably a form of *I. polystachya* L.; in a note under that species I have mentioned the different opinions that have been held about the plant figured.

The last revision of *Ixia* to be published is that of Baker in the sixth volume of the Flora Capensis. Reference has already been made to the fact that his treatment of the genus in 1896 in the Flora Capensis is not the same as in his Systema Iridacearum published in 1877. In his last work he combined *Morphixia* with *Ixia* and described twenty-three species, divided among four sub-genera as follows: *Ixia* 14; *Eurydice* 1; *Morphixia* 5; *Hyalis* 3. As mentioned before, four of the species have since been found to belong to other genera.

In 1888 Pax, in Engler and Prantl's Pflanzenfamilien, divided the genus into three sections, *Ixia*, *Eurydice* and *Morphixia* (including *Hyalis*). Diels, in the second edition of the Pflanzenfamilien, published in 1930, also divided the genus into three sections but he combined *Eurydice* with *Ixia* and treated *Morphixia* and *Hyalis* as separate. In 1895 Durand and Schinz, in their Conspectus Florae Africae, listed forty-one species of *Ixia* but made no mention of sections or subgenera, nor did Phillips refer to them in 1951 in the second edition of his Genera of South African Plants, where he gave the number of species in *Ixia* as 25—30. In the present revision the three sections as proposed by Diels are maintained and I have also transferred *Tritonia* subgenus *Dichone* to *Ixia*.

THE SUBGENUS **DICHONE**

The earliest reference to *Dichone* that has been seen is that of Salisbury in the first volume of the Transactions of the Horticultural Society (p. 320), published in 1812, which reads as follows: "*Dichone crispa*. Laws. Cat. p. 6. *Ixia crispa*. Ker. in Bot. Mag. n. 599 cum Ic. *Ixia crispa* Thunb. Diss. n. 8. t. 2. f. 3."

Up to the present all efforts to trace Lawson's Catalogue have failed and it seems very unlikely that it is extant to-day. There is no copy in the libraries of Kew, the British Museum or the Linnaean Society in London, and an appeal for information made on my behalf to the firm of Peter Lawson & Son in Edinburgh reveals that the firm has nothing prior to 1851, nor could they find anything relative to Peter Lawson before 1847 in the Royal Botanic Gardens, Edinburgh, the Edinburgh Public Libraries or the National Library of Scotland.

As no generic characters were supplied by Salisbury, and it is extremely unlikely that any were given in Lawson's Catalogue, *Dichone* Laws. ex Salisb. must be regarded as a *nomen nudum*. Baker, in his Systema Iridacearum, published in 1877, cited *Dichone* "Laws." Salisb. as a synonym of *Tritonia* and adopted the name, giving a brief diagnosis, for a section of that genus (Journ. Linn. Soc. 16: 162). In his Handbook of the Iridaceae and the Flora Capensis, published in 1892 and 1896 respectively, he raised the status of this section and established *Dichone* as a subgenus of *Tritonia.* Since it has not been possible to verify Salisbury's reference to Lawson's Catalogue I have omitted Lawson's name from the citation and ascribed the subgenus to Salisb. ex Baker on transferring it from *Tritonia* to *Ixia.* Both Stapf and Sealy ascribed the genus *Dichone* to Salisbury, the former in a note under t. 9038 in the Botanical Magazine (1924) and the latter under t. 9592 (1939—40).

Baker placed two species in *Tritonia* section *Dichone* in his Systema Iridacearum and three species and one variety in *Tritonia* subgenus *Dichone* in the Flora Capensis. This small group of species has been subjected to a few other changes and they have been variously regarded as constituting a distinct genus or a section of some other genus by different botanists. Most of them were assigned to the genus *Ixia* when they were first described.

In 1827 Ecklon, in his Topographisches Verzeichniss, placed them in a separate genus, *Agretta*, but as he gave no diagnostic characters this is a *nomen nudum.* Klatt described a new genus, *Tritonixia*, in 1882 (Abh. Naturf. Ges. Halle 12: 355 and Erganz. 23), and transferred to it several species of *Tritonia*, including the type species of that genus! He divided *Tritonixia* into two sections, *Eutritonixia* and *Dichone*, placing in the latter the three species placed in *Tritonia* subgenus *Dichone* by Baker. In 1895 Durand and Schinz upheld the genus *Tritonixia* in part only (Consp. Fl. Afr. 5: 209), to contain the three species assigned to the section *Dichone* by Klatt and one which he had placed in *Eutritonixia.* This extraordinary treatment by Klatt, Durand and Schinz is open to much criticism.

Bentham and Hooker, in 1883, made a brief reference to *Dichone* under *Tritonia* in their Genera Plantarum (3: 708), and remarked that the two species of Baker's section *Dichone* had characters more like those of *Ixia* except that the stamens and style were more or less lateral. Pax, in the first edition of Engler and Prantl's Pflanzenfamilien (1888) and Diels in the second edition (1930) followed the treatment prescribed by Baker in 1877 in his Systema Iridacearum.

It is generally agreed that the genus *Tritonia*, as arranged in the Flora Capensis, is most unsatisfactory and requires revision. A broad outline for a revision was proposed by Stapf in 1924 under t. 9038 in the Botanical Magazine, and supported by Sealy in 1939—40 under t. 9592 of the same work. Among other changes Stapf suggested that Salisbury's genus *Dichone* should be restored. There is no doubt at all that this group of species should be removed from *Tritonia* but whether *Dichone* should be treated as a distinct genus is not so certain and after examining a large number of plants, both living and dried, I found that there is so close an affinity with *Ixia* that I do not consider that it can be regarded as a separate genus and have accordingly transferred the subgenus *Dichone* from *Tritonia* to *Ixia*.

Of the eight species now recognized as belonging to this subgenus, two are new and two, *I. micrandra* Baker and *I. trifolia* Lewis, are now transferred here from subgenus *Ixia*. The vegetative parts of these eight species are the same as those of various species of *Ixia* and the short membranous bracts and bracteoles are characteristic of the genus. With the exception of *I. scillaris*, the flowers are regular and on the whole they are more uniform in size and colouring than in section *Ixia* of the subgenus *Ixia*, which they most closely resemble.

Some of the species have very distinctive anthers in which the cells do not open right to the apex but shed their pollen through narrow slits, but in others they open widely from base to apex as in *Ixia*, and in varieties of *I. micrandra* both types occur. The only stable character which separates this group of species from *Ixia* is found in the style branches, those of *Ixia* being folded together lengthwise and flat with the stigmatic surface on the margins, in some species only near the top, whereas in the subgenus *Dichone* they are more or less filiform or cylindrical with inrolled margins and the stigmatic surface at the tip.

I. scillaris differs from the other species in the subgenus in having a somewhat stouter stem and slightly irregular flowers with reclinate pendulous anthers not symmetrically arranged round the style, but in all other respects its characters are the same as those of other species in the group. In previous papers on the Iridaceae I have pointed out that the symmetry of the flower is not an infallible diagnostic character and must be considered in conjunction with the vegetative and floral characters of the plant.

DIAGNOSTIC CHARACTERS

CORM

Throughout the genus the corm is small, usually 1—2 cm. in diameter though sometimes slightly more or less, ovoid to subglobose in shape, and situated shortly below the ground surface. The pale to dark brown tunics vary in texture from very fine, sometimes almost membranous, to coarse, occasionally somewhat lignified, and in nearly all species they are either reticulate or the strands are vertical and parallel in the lower half, becoming confluent and more or less reticulate above; in a few of them they extend up to the ground surface in a neck. Clusters of cormlets are found round the corm in a few species and in a few others the corm gives rise to slender stolons which terminate in a single cormlet or cluster of very small cormlets. Very little use has been made of these characters in determining the species as they are seldom confined to a single species.

STEM

The majority of species are characterized by a slender flexible erect stem and only in a few is it somewhat stouter. It varies in height from about a foot to four feet, the average being one and a half to two and a half feet, and may be simple or branched. In some species it is always simple and in others predominantly branched, often with characteristic branches which may be short or long, straight and erect or patent and flexuose. The very short 1-flowered branchlets often found in two or three species in the section *Morphixia*, such as *I. capillaris*, *I. marginifolia* and *I. pauciflora*, give the inflorescence a racemose appearance. The absence or presence of branches and their structure afford some characters for differentiating species but they are not entirely reliable since the growth of the plant is largely affected by various factors such as differences in soil, aspect, shade, moisture and altitude, and these naturally may also affect the branching.

The inflorescence varies from a single terminal flower to a dense many-flowered spike, with the floral arrangement distichous or spiral. In several species the rachis is conspicuously flexuose and in some of them the spike is more or less declinate.

LEAVES

The leaves are few in all species, generally comprising two short basal sheathing leaves which are often more or less withered before the plants have reached the flowering stage, and two to six short to long fully developed green leaves, usually one to four basal and one or two cauline, the latter consisting mainly of a long erect amplexicaul sheathing part. In all species the leaves are glabrous and in the majority they are linear or linear-lanceolate, but they vary from linear-filiform in some to ensiform in a few others, and in texture they vary from soft and grass-like with veins just visible to firm and somewhat leathery with thickened margins and prominent, conspicuous veins. As a rule they are erect or suberect but in a few species, especially those growing in more arid parts such as Namaqualand, Calvinia and Laingsburg, one or two of the lower leaves are curved and arcuate or falcate. *I. vanzyliae* has leaves with undulate margins and in *I. crispa* they are very much more crisped or undulate. As there is a comparative stability in the form and texture of the leaves in most species, a few of the characters mentioned have been used for diagnosis.

BRACT AND BRACTEOLES

Short membranous bracts and bracteoles are characteristic of the genus but there are a few variations in shape, colour and texture which provide some characters for distinguishing the species. The bracts vary in shape from oblong-lanceolate and acute to oblong-ovate or obovate and more or less obtuse. They are usually somewhat tridentate or tricuspidate, often with the middle tooth longer and apiculate, but in the same species, sometimes even on the same plant, the apex may be acute, tridentate or subobtuse. One species, *I. stolonifera*, is distinguished by the three long setaceous cusps of the bract.

In most species the bracts are pellucid or semi-pellucid and colourless or more or less suffused with pale pink or mauve but there are a few in which they are opaque, e.g. *I. conferta* and *I. monadelpha*, and in a few others the upper portion is brown-membranous, rust-coloured or densely streaked with fine reddish brown lines, as in *I. maculata* and *I. framesii*, or occasionally they are completely brown as in *I. brunneobractea*. The brown-membranous bracts are usually rather soft and in the three species mentioned they tend to become torn at the apex as the flowers develop, whereas in almost all other species they are moderately firm and retain their form unchanged into the fruiting stage.

The bracteoles of all species are about the same length as the bract and similar in colour and texture, but they are conspicuously two-veined, usually bicarinate, and bifid, bidentate or bicuspidate. The bracts of a number of species have a few dark veins, usually three though there are sometimes five or more, or occasionally there is only one.

FLOWERS

Few genera have such a wide range of colours as *Ixia* in which there is almost every shade from white to purple-black, while the green flowers of *I. viridiflora*, with a purple-black or maroon circular stain in the middle, are unique. In his treatment of the genus in the Flora Capensis, Baker laid much stress on the colour of the flowers for distinguishing the species within the subgenera but, with a few exceptions, it is apt to be extremely variable and is therefore by no means a reliable diagnostic character. In some cases where it has been used in the past it has resulted in confusion and a few superfluous names being given to some of the species. *I. polystachya*, for example, was described as having white flowers, and though this species is now known to have colours ranging from pure white, or white with a pale blue, green or mauve circular stain in the middle, to pale or deep mauve or pink, with a darker stain, in the past only the white form was recognized as *I. polystachya* (or *I. erecta*) and most authors placed the other colour forms as varieties of *I. maculata*.

The various colour forms of *I. monadelpha* have at times been named and treated as varieties or species, and the white and crimson-flowered forms of *I. campanulata* have also been treated as separate species.

A number of species in the section *Ixia* have a conspicuous dark or contrasting circular stain of colour in the middle of the flower and in the past it was thought that this character was confined to this group but it is now known to occur in the section *Morphixia* as well, e.g. *I. framesii* and *I. leipoldtii.*

(i) *Perianth tube and lobes*

Throughout the genus the tube is straight, rarely becoming slightly curved with age, but it varies in length from 2 or 3 mm. to 7 cm., and in shape from campanulate to slender and cylindrical, sometimes more or less filiform. The character of the tube has been largely used not only for differentiating species but also as a basis for segregating the sections in the subgenus *Ixia.*

The section *Morphixia* is distinguished by its comparatively short tube which is either campanulate or dilated into a narrow or broad funnel below the lobes, with the stamens arising within the tube, near the base to shortly below the top, and the filaments decurrent on the tube. An exception is *I. fucata* which differs in having a fairly broad cylindrical tube not dilated to the throat, but as the general appearance and other characters of the plant are like those of certain species in this group it has been placed here. In the section *Hyalis* the tube is more elongated, usually distinctly longer than the lobes, and subcylindrical, very slightly and gradually expanded from base to throat or only near the top. As in *Morphixia,* the stamens arise within the tube, shortly or well below the top. Section *Ixia* differs from the other two in having a short cylindrical tube, rarely very slightly dilated below the throat, and the stamens arising at the top of the tube. There is a certain degree of variability in the shape and length of the tube in the three sections, but when these are considered in conjunction with the position of the stamens it has been found that with one or two exceptions the species can be readily placed in one or other of the groups.

The lobes are equal or subequal and oblong, obovate or occasionally suborbicular, but though the length of the lobes relative to the length of the tube has been used as a diagnostic character, little use has been made of the length and shape of the lobes as these are often very variable within the species.

(ii) *Stamens*

The stamens afford some characters of considerable diagnostic value, especially in the shape, size and method of dehiscence of the anthers, and as mentioned in connection with the perianth tube, the position of attachment of the filaments to the tube. The relative length of the anthers to the filaments is stable in most species and has been used for distinguishing some of them, and in the sections *Morphixia* and *Hyalis* the length and position of the stamens in relation to the perianth tube is used.

Baker considered the connate filaments of *I. monadelpha* to be of taxonomic importance and used this as a basis for establishing *I. monadelpha* in a subgenus by itself, *Eurydice*, but in my treatment of the genus I have followed Diels in sinking *Eurydice* in the section *Ixia* as I do not consider this character by itself to be of much significance. In several species in the section *Ixia* the filaments are more or less connivent at the base and, although not previously recorded, they are nearly always partly connate in *I. maculata*, usually only at the base but sometimes to the middle, and in *I. maculata* var. *intermedia* very often to the top. In *I. dubia* they are almost always free but in a few specimens they have been found to be slightly connate.

In the three sections of the subgenus *Ixia* the anther cells open widely from base to apex but in some species in the subgenus *Dichone* the cells do not open quite to the apex and the pollen is shed through a narrow slit. Anthers with both types of dehiscence occur in varieties of *I. micrandra* and in this species, as well as *I. crispa* and one or two others in the subgenus *Dichone*, the filaments are very short and anthers small, somewhat orbicular in shape and subdidymous. *I. scillaris* in this subgenus differs from all other species in having its stamens asymmetrically disposed, with the filaments of two slightly twisted towards the third and reclinate pendulous anthers.

(iii) *Gynaecium*

The ovary in all species is small, more or less oblong or rotund and many-seeded, and offers little of diagnostic value, nor is there much difference in the mature capsules and seeds. The style almost always reaches to the top of the perianth tube or above it and the relative position of the style branches with regard to the stamens is of some importance, though this character should be used with caution as in two or three species it is variable, e.g. *I. polystachya* and *I. paniculata*, and in others where it is normally stable a few exceptions have been found.

The character of the style branches has proved to be of very great importance and affords a means of distinguishing the species of the subgenus *Dichone* from those of *Ixia* which otherwise, in the case of one or two of them, has presented some difficulty. In all species in both subgenera the style branches are relatively short, narrow and generally more or less recurved, but in the subgenus *Ixia* they are conduplicate and stigmatic on the margins, sometimes only near the apex, and in subgenus *Dichone* they are involute-filiform or involute-cylindrical and stigmatic only at the tip.

DESCRIPTION OF THE GENUS

IXIA

L. Sp. Pl. ed. 2. 51. 1762 partim, emend. Ker-Gawl. in Koen. & Sims Ann. Bot. 1: 226. 1804 excl. sp.; Baker, Journ. Linn. Soc. Bot. 16: 90. 1877, nom. cons. (non L. Sp. Pl. 36. 1753) auct. Internat. Rules Bot. Nomencl. Append. III. n. 1302. 1935 et 1956. Benth. & Hook. Gen. Pl. 3: 704. 1883; Pax in Engl. & Prantl Pflanzenfam. II, 5: 154. 1888; Baker, Handbk. Irid. 160. 1892 et Fl. Cap. 6: 76. 1896; Marloth, Fl. S. Afr. 4: 145. 1915; Phill. Gen. S. Afr. Fl. Pl. 173. 1926 et ed. 2. 217. 1951; Levyns, Guide to Fl. Cap. Pen. 80. 1929; Diels in Engl. & Prantl Pflanzenfam. ed. 2. 15 a: 486. 1930; Lewis in Adamson & Salter Fl. Cap. Pen. 248. 1950.

HYALIS Salisb. Trans. Hort. Soc. 1: 317. 1812, nom. nud.

DICHONE Laws. ex Salisb. l. c. 320, nom. nud.

MORPHIXIA Ker, Gen. Irid. 105. 1827; Baker, Journ. Linn. Soc. Bot. 16: 96, pro parte, excl. syn. *Hyalis*; Klatt, Abh. Naturf. Ges. Halle 12: 382 et Erganz. 49. 1882, pro parte.

FREESEA Eckl. Top. Verz. 30. 1827, nom. nud.

AGRETTA Eckl. l. c. 23, nom. nud.

WUERTHIA Regel, Bot. Zeit. 9: 595. 1851.

HOUTTUYNIA Houtt. Nat. Hist. 12: 448. 1780, nom. rejic.; non Thunb. 1784, nom. cons. auct. Internat. Code. Bot. Nomencl. Append. III. n. 1857. 1956.

The name is taken from an old Greek name for a plant noted for the variability of its colouring. The common name for several species is Klossie or Kalossie, probably derived from klokkie (little bell).

Corm small, ovoid to globose, with tunics of fine to moderately coarse fibres, usually more or less reticulate, sometimes extending up in a short neck. *Stem* nearly always slender and wiry, simple or branched. *Leaves* few, distichous, filiform to ensiform, soft and grass-like to firm with prominent veins. *Spike* few to many-flowered, lax or fairly dense, sometimes capitate, distichous or spirally arranged. *Bract* short, membranous or chartaceous, oblong-lanceolate, ovate or obovate, usually tridentate or shortly cuspidate or tricuspidate, sometimes with a few dark veins; *bracteoles* about as long as the bract, bicuspidate or bifid, 2-veined and usually bicarinate. *Flowers* small to fairly large, almost always actinomorphic with the stamens symmetrically disposed, in one or two species zygomorphic with the perianth lobes equal but sometimes slightly irregularly placed and reclinate pendulous anthers asymmetrically arranged; *perianth tube* short or long, cylindrical and slender or more or less dilated upwards and infundibuliform or campanulate; *lobes* equal or subequal, patent, usually subrotate, oblong, obovate or occasionally suborbicular. *Stamens* arising at top of perianth tube or below, included in the tube or well exserted; filaments filiform, rarely flat, shorter or longer than the anthers, sometimes more or less connate; anthers basifixed or attached shortly above the base, linear to suborbicular, sagittate or rounded at the base, the cells usually opening widely from base to apex but in some species by a narrow slit not extending to the apex. *Ovary* small, oblong or rotund, many-seeded; style filiform, reaching to top of perianth tube or well exserted, with three short spreading branches. *Capsule* small, oblong to globose, thin-walled, sometimes membranous, loculicidally 3-valved; seeds small, brown, more or less angled by pressure.

Type species: *I. polystachya L.*

Key to the Subgenera

1. Flowers regular with a short or long perianth tube varying from filiform to campanulate and stamens symmetrically disposed; anthers linear, linear-oblong or lanceolate with narrow cells opening widely from base to apex; style branches conduplicate and stigmatic on the margins, sometimes only near the apex . . *Ixia*
 (Exception: stamens occasionally directed to one side and unilateral in a form of *I. fucata*)

1. Flowers always with a short slender cylindrical perianth tube, regular with the stamens symmetrically disposed or in one or two species zygomorphic with reclinate pendulous anthers asymmetrically arranged; anthers small, suborbicular to oblong, usually subdidymous with a narrow connective and fairly wide cells sometimes opening from base to apex but more often by a narrow slit not extending to the apex; style branches involute-filiform or involute-cylindrical, stigmatic at the apex only *Dichone*

Key to Sections of Subgenus *IXIA*

1. Perianth tube slightly to distinctly expanded towards the throat, rarely broadly cylindrical or tubular to the top; stamens arising shortly or well below top of perianth tube, the filaments always free.
 2. Perianth tube up to 2 cm. long, dilated into a narrow or broad funnel below the lobes (rarely tubular to the throat and not dilated), shorter than the lobes or occasionally as long or slightly longer; stamens arising shortly or well below top of perianth tube with the filaments decurrent on the tube and included or well exserted . . . . 1. *Morphixia*
 2. Perianth tube 2 cm. or more long (rarely less), subcylindrical, slightly and gradually expanded from base to throat or in the upper third, usually distinctly longer than the lobes; stamens arising shortly or well below top of perianth tube and included or exserted . . . . 3. *Hyalis*
 (Exception: in southern form of *I. longituba* the perianth tube is shorter, 1·2—1·8 cm. long, sometimes slightly shorter than the lobes)

1. Perianth tube short, up to 1·8 cm. long but usually less, cylindrical, slender, rarely slightly expanded to the throat, shorter than the lobes; stamens arising at top of perianth tube and well exserted, the filaments not decurrent on the tube, often connivent at the base and sometimes partly or entirely connate .. .. 2. *Ixia*

(Exceptions: perianth lobes sometimes as long as tube in *I. monadelpha;* perianth tube subinfundibuliform in *I. purpureorosea* and sometimes in *I. flexuosa* but filaments arising at top of tube and not decurrent)

KEY TO THE SECTION *MORPHIXIA*

1. Perianth tube tubular throughout or at least in the upper half, not dilated to the throat; stamens exserted .. .. 12. *fucata*

1. Perianth tube dilated to the throat and narrowly to broadly funnel-shaped or campanulate, rarely somewhat tubular but if so then the stamens not or very little exserted.

2. Stamens with filaments shortly to well exserted from perianth tube.

3. Perianth tube short, about half as long as the lobes, not or very little exserted from the bract.

4. Bracts shining chestnut-brown all over, sometimes torn at the apex when flowers open .. .. .. 4. *brunneobractea*

4. Bracts not as above.

5. Leaves linear or linear-filiform, up to 2 mm. wide .. 2. *capillaris*

5. Leaves lanceolate or ensiform, 0·5—1·8 cm. wide, the lowest often falcate.

6. Plant 10—20 cm. high, with 1 or occasionally 2 branchlets .. .. 5. *latifolia* var.

6. Plant usually more than 25 cm. high, with 4 to several branchlets .. .. 1. *marginifolia*

3. Perianth tube about as long as the lobes or slightly longer or shorter (sometimes about a third shorter), well exserted from the bract.

7. Bracts with the upper half dull brown or rust-coloured, inconspicuously nerved, often torn at the apex .. .. 9. *framesii*

7. Bracts not as above.

8. Leaves linear-filiform, not more than 1 mm. wide; bracts about 1 cm. long and flowers fairly large, 1 or 2, sometimes 3, to a plant .. .. 7. *pauciflora*

8. Leaves linear to ensiform, seldom less than 2 mm. wide but if so then the bracts not more than 5 mm. long and flowers 4 or more to a spike.

9. Filaments distinctly longer than anthers.

10. Leaves 3, 0·8—2 cm. wide .. .. .. 5. *latifolia*

10. Leaves 3—6, 1—4 mm. or occasionally to 5 mm. wide.

11. Corm tunics usually extending up in a short neck; bracts 4—5 mm. long; perianth tube slender, not more than 3 mm. diam. at the throat .. .. 8. *cochlearis*

11. Corm tunics not extending up in a neck; bracts 5—8 mm. long; perianth tube 4—7 mm. diam. at the throat .. .. 5. *latifolia* var.

9. Filaments and anthers about the same length or anthers slightly longer than filaments.

12. Flowers yellow (occasionally white but if so then very small, up to 1·5 cm. long), fragrant; style usually reaching to top of perianth tube with comparatively long slender branches usually about half its length .. .. 10. *odorata*

12. Flowers not yellow; style reaching to middle of filaments or above, with short branches less than half its length.

13. Perianth tube 4—7 mm. diam. at the throat 5. *latifolia* var.

13. Perianth tube narrowly funnel-shaped, 2—3 mm. diam. at the throat.

14. Perianth tube slightly longer than the lobes .. .. 11. *stohriae*

14. Perianth tube shorter than the lobes .. 13. *orientalis*

2. Stamens included in perianth tube or the filaments included and anthers partly to entirely exserted, rarely the tips of the filaments very shortly exserted.

15. Perianth tube not or only shortly exserted from bract, 5—8 mm. long, about half as long as the lobes.

16. Leaves linear or linear-filiform, not more than 2 mm. wide .. .. 2. *capillaris*

16. Leaves lanceolate or ensiform, 0·5—1·4 cm. wide .. 3. *rapunculoides*

15. Perianth tube well exserted from bract, 0·8—2 cm. long, usually as long as lobes or slightly shorter or longer, rarely only half as long.

17. Bracts dark brown or rust-coloured above the base, inconspicuously nerved, soft and usually torn at the apex; flowers deep salmon-pink, reddish, red and yellow or yellow, with a small dark stain in the middle 9. *framesii*

17. Bracts not as above, if brownish then conspicuously 3 or 5-veined and not soft and torn at the apex.

18. Perianth lobes white with the lower third wine-coloured, orbicular or suborbicular with a short broad claw .. .. 6. *leipoldtii*

18. Perianth lobes unicoloured, usually more or less oblong, if suborbicular then not or scarcely clawed at the base.

19. Perianth tube narrow, slightly and gradually dilated upwards but not more than 3 mm. diam. at the throat, sometimes the upper half somewhat tubular .. .. 11. *stohriae*

19. Perianth tube widely dilated and 0·5—1 cm. diam. at the throat, funnel-shaped or campanulate.

20. Leaves linear or linear-filiform, not more than 1 mm. wide; flowers few, usually 1—3 to a plant, fairly large with the perianth tube about 1·5 cm. long.. .. 7. *pauciflora*

20. Leaves linear to ensiform, more than 1 mm. wide; flowers usually several or many to a plant .. .. 3. *rapunculoides* var.

KEY TO THE SECTION *IXIA*

1. Filaments free.

2. Leaves with undulate margins.. .. .. 27. *vanzijliae*

2. Leaf margins not undulate.

3. Flowers green with a dark purple or reddish centre; anthers very long and narrow, about three times as long as filaments .. .. 17. *viridiflora*

3. Flowers not green; anthers from as long as filaments to twice or slightly more than twice as long, rarely 3 times as long.

4. Bracts with the upper half or more rust-coloured or densely streaked or spotted with reddish-brown and more or less papyraceous.

5. Flowers cream-coloured, pale yellow or red with a dark centre; style reaching to base of filaments (rarely above) with the branches projecting between them at the base .. .. 19. *conferta*

5. Flowers orange or yellow; style reaching to base or middle of anthers, the filaments connivent at the base .. .. 29. *maculata*

4. Bracts sometimes inconspicuously spotted with brown at the apex, rarely slightly rust-coloured but if so then not papyraceous.

6. Bracts with 3 long setaceous cusps .. .. .. 16. *stolonifera*

6. Bracts usually tridentate or tricuspidate but the cusps not with long setaceous tips.

7. Perianth tube very short compared with lobes, 2—4 mm. or occasionally to 6 mm. long, the lobes usually 4—8 times longer.

8. Leaves long, linear, firm and erect, the lower 1 or 2 overtopping the spike .. .. 25. *vinacea*

8. Leaves occasionally reaching to base of spike but usually much shorter.

9. Stem straight; bracts 6—10 mm. long, slightly to distinctly longer than wide.

10. Flowers with a conspicuous purple-black stain in the middle .. .. 26. *gloriosa*

10. Flowers concolorous or with a small insignificant white or greenish circle in the middle .. .. 18. *patens*

9. Stem straight or flexuose; bracts short, 4—6 mm. long, usually slightly wider than long.

11. Stem almost always simple, 10—35 cm. ong; flowers crimson with or without a longitudinal white band, pure white or white flushed with red outside .. .. .. 23. *campanulata*

11. Stem usually 35—75 cm. long, simple or more or less divaricately branched; flowers pale pink or mauve with a purplish red star near the base of each lobe .. .. .. 24. *metelerkampiae*

7. Perianth tube 0·4—1·5 cm. long, occasionally as long as the lobes but usually about a third to half as long.

12. Anthers and filaments equal in length or the anthers up to 1 mm. longer.

13. Leaves firm and more or less costate with several fairly prominent veins and narrow cartilaginous stramineous margins; stem usually fairly short and moderately stout .. 18. *patens*

13. Leaves rarely as above, the veins usually few and scarcely prominent and margins not or only slightly raised; stem usually long and slender.

14. Bracts often pinkish with a few fine dark veins; flowers mauve, pink or white, the white usually with radiating purplish lines; perianth tube 4—6 mm. long, less than half as long as the lobes which are usually somewhat campanulate at the base when not fully expanded .. .. 15. *flexuosa*

14. Bracts usually white or whitish with pale insignificant veins; flowers cream or pale yellow, rarely pale mauve-pink; perianth tube usually 0·6—1·2 cm. long and about half as long as the lobes which are seldom slightly campanulate at the base .. 14. *polystachya*

12. Anthers distinctly longer than filaments, up to twice as long or sometimes more.

15. Spike lax or moderately lax, the bracts not or very slightly imbricate.

16. Leaves 3—4; bracts 8—10 mm. long; perianth lobes distinctly campanulate at the base; anthers connivent at the apex .. .. 26. *gloriosa*

16. Leaves more than 4; bracts usually less than 8 mm. long; lobes not or hardly campanulate at the base; anthers more or less diverging .. .. 14. *polystachya*

15. Spike fairly to very closely flowered, often more or less capitate, the bracts distinctly imbricate.

17. Corm with a fibrous neck; leaves linear, the lower 1 or 2 overtopping the spike .. 25. *vinacea*

17. Corm without a neck; leaves not or seldom reaching to base of spike.

18. Stem with 1 or more branches spreading stiffly at an angle of 45—90 degrees, terminating in a short few-flowered erect spike; flower with a large dark or contrasting stain covering a third to half its area .. 21. *rouxii*

18. Branches when present usually erect or suberect but if as above then the flower with a smallish dark or contrasting stain covering a quarter of its area or less.

19. Stem simple; bracts whitish and soft; flower mauve-pink with a purple-black stain in the middle; perianth tube subinfundibuliform 22. *purpureorosea*

19. Stem simple or branched; bracts usually moderately firm; perianth tube cylindrical.

20. Flowers bright yellow or orange with or without a dark stain in the middle, the outer lobes sometimes red outside.

21. Bracts usually widest near the apex, the lower half more or less opaque and often yellowish; perianth lobes obovate or suborbicular and somewhat unguiculate, often with distinct interstices at the base 19. *conferta* var.

21. Bracts seldom widest near the apex, more or less pellucid, not yellowish below: perianth lobes usually widest at or near the middle and more or less overlapping at the base.

22. Bracts nearly always faintly striate; flowers usually with a dark stain; style reaching to middle or top of filaments, rarely only to

the base but if so then the leaves firm with prominent cartilaginous margins .. .. 28. *dubia*

22. Bracts not or seldom faintly striate; flowers rarely with a small dark stain; style seldom reaching above base of filaments but if so then the leaves fairly soft without prominent margins .. .. .. 14. *polystachya* var. *lutea*

20. Flowers not bright yellow or orange.

23. Perianth lobes obovate or suborbicular and somewhat unguiculate, often with distinct rounded or subacute interstices at the base .. 19. *conferta* var. *ochroleuca*

23. Perianth lobes not as above, usually widest at or near the middle and more or less overlapping at the base.

24. Leaf margins prominent, cartilaginous, involute and more or less crenulate; stamens erect, the anthers connivent at the apex .. 20. *versicolor*

24. Leaf margins sometimes more or less prominent and cartilaginous but not crenulate; stamens usually diverging .. 14. *polystachya* vars.

1. Filaments partly to entirely connate.

25. Filaments connate at the base only, rarely nearly to the middle.

26. Bracts 0·8—1·5 cm. long, the upper half or more ferruginous and papyraceous, usually more or less lacerated at the apex .. .. 29. *maculata*

26. Bracts 5—9 mm. long, not as above.

27. Bracts pellucid, colourless or pinkish, usually more or less striate with several slightly prominent pale veins; anthers diverging .. .. 28. *dubia*

27. Bracts more or less opaque, whitish nearly always with minute dark or reddish brown flecks at the apex and often with a dark cusp or mucro; anthers erect 31. *monadelpha*

25. Filaments connate to the middle or the top.

28. Flowers orange or yellow with obovate, oblong or somewhat ovate more or less concave lobes 1—2 cm. wide and usually from 1½—3 times as long as the tube.

29. Bracts usually obtuse or truncate (occasionally acute or shortly tridentate), whitish or more often distinctly bicoloured with the lower half whitish and upper ferruginous and papyraceous; perianth tube 6—8 mm. long (rarely to 1 cm.), not or only shortly exserted from the bract; filaments usually connate to the middle .. .. 29. *maculata* var.

29. Bracts with a short to fairly long cusp or mucro, carinate, pallid with brown or reddish brown flecks; perianth tube 1—1·5 cm. long, well exserted from the bract; filaments usually completely connate .. 30. *curta*

28. Flowers variously coloured but not or rarely orange or yellow, the lobes usually patent, oblong and up to 1 cm. wide, generally about as long as the tube or slightly shorter or longer, occasionally obovate or obovate-oblong and up to 1½ times as long as the tube but if so then the flowers not orange or yellow .. .. .. 31. *monadelpha*

Key to the Section *HYALIS*

1. Filaments included in the perianth tube and anthers either included or partly exserted.

2. Stem usually branched; perianth tube 4—7 cm. long (rarely 3·5 cm.) .. .. 32. *paniculata*

2. Stem usually simple; perianth tube not more than 3 cm. long.

3. Leaves 4—5; anthers included in perianth tube .. .. 33. *splendida*

3. Leaves 2—3; anthers exserted from perianth tube .. .. 34. *paucifolia*

1. Filaments shortly to well exserted from perianth tube.

4. Leaves 2—3; perianth lobes 0·7—1·2 cm. long, less than half as long as the tube; filaments 2—4 mm. long, shortly exserted from the tube .. .. 34. *paucifolia*

4. Leaves 4—6; perianth lobes 1·2—2 cm. long, usually more than half as long as the tube, sometimes as long or even slightly longer.

5. Flowers large, the lobes usually 2 cm. long, filaments 7—8 mm. and anthers 5—7 mm. long; style reaching to middle or top of anthers .. .. 35. *bellendenii*

5. Flowers somewhat smaller than above, the lobes usually less than 2 cm. long, filaments and anthers slightly shorter and style not reaching above middle of anthers, usually below .. .. 36. *longituba*

Key to the Subgenus *DICHONE*

1. Flowers regular with the stamens symmetrically disposed.

2. Leaf margins much crisped or undulate .. .. .. 38. *crispa*

2. Leaf margins flat.

3. Perianth tube very short, not more than 1·5 mm. long; flowers pale blue or violet-blue .. .. 41. *brevituba*

3. Perianth tube 3—6 mm. long; flowers mostly pale to deep pink, occasionally mauve or white.

4. Leaves very narrow, rarely more than 1 mm. wide and usually terete, subterete or filiform .. .. .. 37. *micrandra*

4. Leaves linear or lanceolate.

5. Anthers 1·5—3 mm. long, suborbicular or broadly oblong.

6. Leaves 3—4, lanceolate, erect and firm to somewhat rigid with stramineous margins and mid-rib, usually brown and spirally twisted towards the apex at flowering time .. .. 39. *stricta*

6. Leaves not as above.

7. Leaves 2, the lower short, lanceolate and firm with 3 prominent stramineous veins .. .. 40. *trinervata*

7. Leaves 2—4, usually fairly long, linear or lanceolate, soft to moderately firm, the veins sometimes prominent but not stramineous .. .. 37. *micrandra* **var.**

5. Anthers 3—5 mm. long, oblong, more than twice as long as wide.

8. Corm usually with a fibrous neck; leaves linear, 2—4 mm. wide, all arcuate; bract 4—5 mm. long **43.** *curvata*
8. Corm without a fibrous neck; leaves lanceolate, usually 0·6—1 cm. wide, the lowest falcate and others usually erect and more or less straight but sometimes arcuate; bract 7—9 mm. long .. .. 42. *trifolia*
1. Flowers slightly zygomorphic with reclinate pendulous anthers not symmetrically disposed.
9. Leaf margins undulate .. .. **44.** *scillaris* var.
9. Leaf margins flat.
10. Leaves linear, all arcuate .. .. **43.** *curvata*
10. Leaves lanceolate or ensiform, occasionally all arcuate but more often the lowest falcate or arcuate and others suberect to erect and straight or almost so .. .. **44.** *scillaris*

SUBGENUS **IXIA**

Flowers actinomorphic; *perianth tube* short or long, cylindrical or slightly to well expanded upwards and infundibuliform or campanulate; *lobes* equal or subequal; *stamens* arising at throat of perianth tube or below, symmetrically disposed, the filaments short or long, occasionally partly to entirely connate: *anthers* linear, linear-oblong or lanceolate, often more or less sagittate, with narrow cells opening widely from base to apex; *style* reaching to top of perianth tube or well exserted, the branches recurved or falcate, linear, oblanceolate or spathulate, conduplicate, minutely papillate or clavellate fimbriate on the margins, sometimes only towards the apex.

Type species: *I. polystachya* L.

Section **MORPHIXIA**

(Ker) Diels in Engl. & Prantl Pflanzenfam. ed. 2. 15 a: 486. 1930. *Morphixia* Ker, Gen. Irid. 105. 1827, pro. gen.; Baker, Journ. Linn. Soc. Bot. 16: 96. 1877; Klatt, Abh. Naturf. Ges. Halle 12: 382 et Erganz. 49. 1882, pro parte. *Ixia* subgen. *Morphixia* (Ker) Baker, Handbk. Irid. 161. 1892 et Fl. Cap. 6. 77: 1896.

Perianth tube up to 2 cm. long, cylindrical at the base and dilated into a narrow or broad funnel below the lobes (in one or two species tubular to the throat and not dilated), usually shorter than the lobes but sometimes as long or occasionally slightly longer; stamens arising shortly or well below top of tube, the filaments decurrent on the tube and included or shortly to well exserted.

(Exceptions: Perianth tube tubular and not dilated to the throat in *I. fucata* and sometimes in *I. stohriae*).

Type species: *I. latifolia* De la R.

1. **I. marginifolia** (Salisb.) Lewis comb. nov.

Hyalis marginifolia Salisb. Trans. Hort. Soc. 1: 318. 1812. *Ixia lancea* Jacq. Ic. t. 281. 1786—93 et Coll. Suppl. 13. 1796; non Thunb. 1784.

I. capillaris Thunb. var. *lancea* (Jacq.) Ker in Curtis' Bot. Mag. sub t. 570. 1802. *Morphixia capillaris* (Thunb.) Ker var. *lancea* (Jacq.) Baker, Journ. Linn. Soc. Bot. 16: 97. 1877. *M. lancea* (Jacq.) Klatt, Abh. Naturf. Ges. Halle 12: 383. 1882. *Ixia laurea* Steud. Nomen. ed. 2, 1: 779, 841. 1840, typ. err.

Corm ovoid or subglobose, 1·5—2 cm. diam.; tunics of fairly coarse reticulate fibres usually extending up in a thinnish neck 1·5—7 cm. long. *Stem* 25—75 cm. high, usually 30—50 cm., firm with 4 to several very short filiform more or less flexuose branchlets, sometimes all directed to one side, sometimes patent or suberect. *Basal sheaths* 2, rarely 3, acute or occasionally acuminate, up to 10 cm. long. *Leaves* 3—4, rarely 5, the 2—3 lower lanceolate or ensiform, acute or subacute, varying from falcate to suberect and much shorter than the stem to half or slightly more than half as long, 6—35 cm. long, 0·8—1·8 cm. wide (rarely 5—8 mm.), firm, several-veined, the mid-rib and margins more or less prominent; cauline leaves 1 or 2, entirely or almost entirely sheathing, usually reaching to or above middle of stem. *Spike* laxly 1—3-flowered, the branchlets very short and 1-flowered or slightly longer and 2—3-flowered. *Bract* oblong or ovate-oblong, 0·7—1 cm. long, truncate or shortly 3-lobed, pellucid, colourless or pale mauve-grey, occasionally pale brown near the apex, with 3 dark veins; *bracteoles* 2-veined and shortly bilobed. *Flowers* small, pale blue, mauve or grey-blue, the tube usually greenish; *perianth tube* widely infundibuliform, 4—7 mm. long, rarely slightly exserted from bract; *lobes* about twice as long as the tube, patent, oblong or obovate-oblong, obtuse, 1—1·4 cm. long, 4—7 mm. wide. *Stamens* arising near middle of perianth tube, the filaments decurrent to the base, 5—7 mm. ong, exserted; anthers linear or linear-oblong, subsagittate, 3—6 mm. long. *Ovary* rotund, 2·5—3 mm. long; style reaching to middle or nearly to top of anthers, the branches linear, oblanceolate or subspathulate, conduplicate, 2—3 mm. long, minutely ciliate towards the apex.

LECTOTYPE. Jacquin Ic. t. 281.

Western mountain karoo vegetation in the Calvinia, Sutherland, Fraserburg and Laingsburg Divisions.

Flowering period. September—October.

CALVINIA. Near Hollerivier, about 15 miles N.E. of Calvinia on Loeriesfontein road, *Lewis* 2513 (BOL, SAM); *Johnson* 589 (BOL, NBG).

SUTHERLAND. Hills near Sutherland, *Hafstrom* and *Acocks* 308 (PRE, S); mountain 14 miles from Sutherland, c. 5,000 ft., *Acocks* 19600 (PRE, NBG); Komsberg, *Marloth* 9782 (PRE); Verlaten Kloof, Jakhals Valley, *Marloth* 9645 (PRE); farm Fransplaas, *Muller* in Herb. *Marloth* 9898b (PRE).

FRASERBURG. Hills near Fraserburg, *Hafstrom* and *Acocks* 309 (PRE, S).

LAINGSBURG. Tweedside, *Lewis* NBG 2704/32 (BOL.)

As Jacquin's plants in Vienna were destroyed during the war his figure of *I. lancea* is selected as the lectotype. It was pointed out by Ker in the Botanical Magazine in 1802 (sub t. 570) and also by N. E. Brown in 1928 (Journ. Linn. Soc. Bot. 48: 48) that *I. lancea* Jacq. is not the same as *I. lancea* Thunb., the latter being a species of *Tritonia* which Dr. Brown named *T. lancea.* When Salisbury transferred *Ixia lancea* Jacq. to his new genus *Hyalis* in 1812 he gave the name *H. marginifolia* to this species, and since Jacquin's name must be rejected Salisbury's specific epithet is now adopted. In the Kew Index (1895) *Ixia lancea* Jacq. is listed as equal to *Tritonia scariosa* but this is an error and should have been *Ixia scariosa* as there is no *Tritonia* so-named.

The species is allied to *I. capillaris*, with similar flowers, but distinguished by its sturdier habit, much wider leaves and more truncate bracts. It is also closely allied to *I. rapunculoides* but the flowers of *I. marginifolia* have a shorter perianth tube and longer stamens well exserted from the tube and not connivent round the style.

A large number of plants were collected near Sutherland by Mr. Acocks (no. 19600), some of which exactly match Jacquin's figure of *I. lancea.* The leaves of these plants are variable, some very short and more or less falcate and others, probably shade forms from among bushes, much longer and erect as in the plant depicted. In the form from the Calvinia Division (*Lewis* 2513 and *Johnson* 589) the leaves are shorter, narrower and distinctly falcate, with the margins and mid-rib only slightly prominent. According to Jacquin the flowers are very sweetly scented but there is no record of this in any of the collections cited above.

2. **I. capillaris** L. f. Suppl. 92. 1781; Thunb. Diss. Ixia 12. t. 2. f. 2. 1783; N. E. Br. Journ. Linn. Soc. Bot. 48: 45. 1928. *I. capillaris* var. *gracillima* Ker, Bot. Mag. t. 570. 1802. *Morphixia capillaris* (L. f.) Ker, Gen. Irid. 106. 1827. *Ixia gracilis* Salisb. Prod. 37. 1796. *Hyalis gracilis* Salisb. Trans. Hort. Soc. 1: 317. 1812. *Ixia tenella* Klatt, Abh. Naturf. Ges. Halle 12: 396 et Erganz. 62. 1882.

Corm ovoid or subglobose, 1—1·5 cm. diam.; tunics of fine reticulate fibres. *Stem* very slender, usually capillary, 20—45 cm. high, occasionally to 55 cm., simple or with 1—3 very short patent or suberect straight or flexuose branchlets. *Basal sheaths* 2 or 3, the lowest colourless, obtuse, the upper 1 or 2 usually brown towards the apex, acute or subacute. *Leaves* 3, erect, the 2 lower linear or linear-filiform with the margins and mid-rib more or less raised, 6—18 cm. long, 0·5—2 mm. wide, often spirally twisted, seldom reaching above middle of stem; upper leaf longer, usually extending for three-quarters way up the stem, sometimes nearly to the top, sheathing, with a short free linear or filiform tip. *Spike* laxly

1—4-flowered, the rachis sometimes flexuose; branchlets usually 1-flowered but sometimes with 2 or occasionally 3. *Bract* oblong, 0·6—1 cm. long, tridentate, pellucid, colourless, brownish or purplish, with 3 dark veins; *bracteoles* bidentate. *Flowers* white, pale blue or mauve, sometimes pale green at the throat; *perianth tube* infundibuliform, 5—7 mm. long, not or only shortly exserted from the bract; *lobes* oblong, obtuse or subobtuse, 1—1·5 cm. long, 4—6 mm. wide. *Stamens* arising near base of perianth tube, the filaments decurrent to the base, 4—7 mm. long, nearly always exserted, rarely included but if so the anthers 5 mm. long and half exserted; anthers 3—5 mm. long, sagittate. *Ovary* rotund, 2—3 mm. long; style reaching to about middle of anthers, the branches recurved, linear or linear-spathulate, conduplicate, 2—3·5 mm. long.

HOLOTYPE. *Thunberg* in Herb. Thunberg, Uppsala.

Flats, hills and mountain slopes, in sandy or clay soils.

Flowering period. July—September.

CLANWILLIAM. Sandveld, between Greys Pass and Graafwater, *Leipoldt* 3608 (BOL); Elands Kloof, upper S. slopes, *Hafstrom* and *Acocks* 307 (PRE); same, 4,500 ft., *Esterhuysen* 3184 (BOL).

PIKETBERG. Near Berg River Bridge, *L. Bolus* (BOL 20836, K, PRE, SAM).

CERES. Gydouw, *Leipoldt* 3820 (BOL); *Leighton* (BOL 26855); Cold Bokkeveld, 6 miles N. of Gydouw Pass, *Lewis* 2662 (SAM); *Middlemost* 1724 (BOL, NBG); Ezelfontein, *Esterhuysen* 20346 (BOL, PRE); between De Keur and top of Gydouw Pass, *Compton*, NBG 2070/36 (BOL); Groenfontein, *Barker* 3050 (NBG); zwischen Hexriviersberg und Bokkeveld, 3,000—4,000 ft., *Drege* (S).

WORCESTER. Hex River Valley, *Dod* 4017 (BOL); *Esterhuysen* 10348 (BOL); Hex River Mts., 3,500 ft., *Drege* 557 (P); Brandwagt, near foot of mountain, *Van Breda* 675 (NBG, PRE).

MALMESBURY. Riebeek Mt., *Loubser* 456 (NBG).

BELLVILLE. Tygerberg, *Pillans* 4754 (BOL).

PAARL. Groot Drakenstein, *Rogers* 10534 (BOL).

STELLENBOSCH. *Duthie* 1507 (BOL); Simonsberg, *Strey* 555 (PRE); *Rehm* (M).

SOMERSET WEST. Vergelegen, *Johnson* (NBG).

MONTAGU. Eendrag, *Lewis* 1607 (SAM); 5 miles E. of Montagu, *Michell* (BOL 15566); Oudeberg, N.E. of Montagu, *Acocks* 20535 (NBG, PRE).

SWELLENDAM. Near Barrydale, *van Niekerk* 573 (BOL).

RIVERSDALE. Near N. side of Riversdale, *Muir* 3248 (BOL, PRE); *Ferguson*, NBG 2033/35 (BOL).

LADISMITH. S. slopes of Anysberg, 2,500 ft. *Wurts* 1428 (NBG).

LAINGSBURG. Witteberg, 5,000 ft., *Compton* 12243 (NBG).
WITHOUT LOCALITY. *Thunberg* (S, UPS).

The slender hair-like stem, narrow leaves and small delicate flowers, with a short funnel-shaped tube not or only very shortly exserted from the bract, distinguish this species from others in the section. It has a wide range of distribution and, as can be seen from the description, is somewhat variable. N. E. Brown gave a detailed description of Thunberg's type (Journ. Linn. Soc. Bot. 48: 45), and stated that it was not at all like *I. capillaris* var. *gracillima* Ker, illustrated on plate 570 of the Botanical Magazine, but among the collections cited above are a few very delicate plants with only one or two flowers which match this figure.

As was pointed out by Dr. Brown (l. c.), "it bears no resemblance either generically or specifically to *I. linearis* Thunb. (= *Gladiolus linearis* (Thunb.) N. E. Br.) with which Baker has united it in the Flora Capensis, nor is it the same as the specimens quoted by him as being *I. linearis*."

The type of *I. tenella* Klatt, *Zeyher* 557 in Herb. Lubeck, Berlin-Dahlem Herbarium, was destroyed in the last war, but in Klatt's collection in the Stockholm Natural History Museum Herbarium there is an illustration of it, with a laid out flower, and it is the same as the plants named *I. capillaris* by Thunberg. In the Flora Capensis Baker cited *I. tenella* Klatt as a synonym of *I. flexuosa* L.

3. **I. rapunculoides** Del. in Red. Lil. t. 431. 1816. *I. capillaris* Thunb. var. *stricta* Ker, Bot. Mag. t. 617. 1803.

A complex species very variable in stature, size and the rigidity of the leaves and branches, with many different local forms some of which are so distinct that they have been treated as varieties.

KEY TO THE VARIETIES

1. Branches filiform, usually fairly long and straight, often more or less pendulous in living plants . . . . *subpendula*
1. Branches almost always flexuose but if not then very short and suberect to erect, varying from filiform to moderately stout.
  2. Leaves flaccid; bracts 6—8 mm. long . . . . *flaccida*
  2. Leaves usually firm with more or less prominent, often cartilaginous margins, rarely flaccid but if so then the bracts about 1 cm. long.
    3. Corm tunics usually extending up in a neck; leaves 4—5 (rarely 6) . . . . *robusta*
    3. Corm tunics not extending up in a neck; leaves 2—3 or occasionally 4.
      4. Perianth tube 1 cm. long or less.
        5. Perianth lobes as long as the tube or up to twice as long; terminal spike nearly always erect and the 4 to several branchlets varying from patent to erect . . *rapunculoides*
        5. Perianth lobes slightly shorter than the tube.
          6. Stem with 1—5 branchlets, the terminal spike usually declinate and branches somewhat rigid, spreading in a zig-zag manner . . . . . . *rigida*

6. Stem simple or with 1—2 very short branchlets, the terminal spike and branchlets not as above .. *subpendula*

4. Perianth tube more than 1 cm. long.

7. Terminal spike and branchlets nearly always erect, the branchlets usually very short, occasionally slightly patent above the base .. .. *namaquana*

7. Terminal spike nearly always declinate; branchlets longer than above and usually spreading stiffly in a conspicuous zig-zag manner .. .. *rigida*

Var. **rapunculoides** (Fig. 1).

Corm ovoid or subglobose, 1—2 cm. diam.; tunics of fairly coarse, often subligneous, reticulate fibres. *Stem* 25—55 cm. high, with 4 to several short filiform flexuose branchlets varying from patent, sometimes horizontal, to erect. *Basal sheaths* 2, colourless, acute, up to 5 cm. long. *Leaves* 3 or occasionally 4, the 2 lower lanceolate or ensiform, much shorter than the stem, up to 1·4 cm. wide, firm, several-veined with prominent margins and mid-rib, the lowest more or less falcate, the second usually shorter and suberect and the cauline leaf usually much longer, reaching to or above the middle of the stem and entirely sheathing; a second shorter sheathing leaf is occasionally present. *Spike* lax, 1—3-flowered; terminal spike erect. *Bract* oblong, 6—8 mm. long, truncate or very shortly 3-lobed or toothed, soft, pellucid, brownish or almost colourless with 3 dark veins; *bracteoles* 2-veined, shortly bilobed or bidentate. *Flowers* fairly small, delicate, pale blue or mauve, the tube usually greenish; *perianth tube* with a short cylindrical base, expanded above and broadly infundibuliform to campanulate, 5—9 mm. long, 5—6 mm. diam. at the throat, usually shortly exserted from the bract; *lobes* patent, oblong, obtuse, 1—1·8 cm. long, 4—7 mm. wide, from as long to twice as long as the tube. *Stamens* arising near middle of perianth tube, connivent in a column round the style, the filaments decurrent to the base of the tube, about 3 mm. long, reaching almost to the throat; anthers slightly to more than half exserted from the tube, linear or linear-oblong, subsagittate, 3—5 mm. long. *Ovary* rotund, 2 mm. long; style reaching to middle or top of anthers, the branches linear or subspathulate, conduplicate, about 1 mm. long, minutely ciliate at the apex.

Lectotype. Red. Lil. t. 431.

Flats in the Calvinia Division at 2,000—3,000 ft. alt., in false succulent karoo or western mountain karoo, and up to 5,000 ft. on the Kamiesberg.

Flowering period. August—September.

NAMAQUALAND. Kamiesberg, Welkom, near Garies, 3,000—4,000 ft., *Esterhuysen* 23700 (BOL); Kamiesberg, between Garies and Leliefontein, *Leipoldt* 3021 (BOL); 3 miles from Leliefontein, 4,300 ft., *Leipoldt* 3606 (BOL); Lilyfontein, 5,000 ft., *Rodin* 1474 (BOL, K, PRE); near Leliefontein, mostly on hills at foot of Eselskop, 4,000—5,000 ft., *Drege* 2640 a (G, K, P).

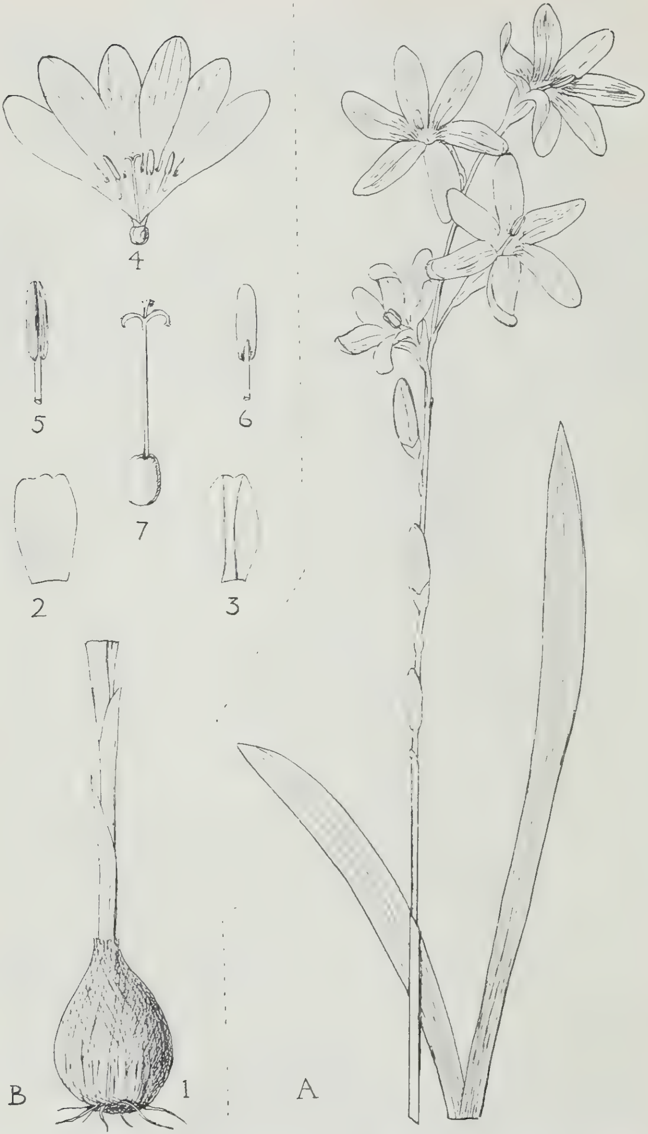


Fig. 1.—*I. rapunculoides.* A. Copied from Bot. Mag. t. 617 (*I. capillaris* Thunb. var. *stricta* Ker). B. *Lewis* No. 5879. 1. Corm and basal sheaths. 2. Bract × 2. 3. Bracteoles × 2. 4. Flower laid open. 5. Stamen, front view, × 3. 6. Stamen, back view, × 3. 7. Gynaecium × 3. Del. G. J. Lewis.

CALVINIA. Bokkeveld, W. of Nieuwoudtville, *Marloth* 7659 (PRE); near Nieuwoudtville, c. 2,000 ft., *Acocks* 14710 (PRE); *L. Bolus* (BOL 19590); 5 miles E. of Nieuwoudtville on Oorlogs Kloof road, *Barker* 6532 (NBG); Oorlogs Kloof, *Barker* 1570 (BOL, NBG); 10 miles along Calvinia-Nieuwoudtville road, *Hardy* 63 (PRE); Calvinia, *Marloth* 12936 (PRE); *Lavis* (BOL 26903); between Middlepost and Calvinia, *Hutchinson* 731 (K); Moordenaarspoort, near Agter Hantamsberg, 26 miles N.E. of Calvinia, *Lewis* 2663 (SAM); Driefontein, S.W. of Calvinia, *Marloth* 10427 (PRE); Bokkeveld, *Watermeyer*, Herb. *Marloth* 5565 (PRE); Wilgebos Farm, near Calvinia, *Lewis* 5879 (NBG).

Baker, Durand and Schinz and others placed *I. rapunculoides* as a synonym of *I. scariosa* Thunb. or *I. incarnata* Jacq., both synonyms of *I. latifolia* De la R., but it differs from that species in having a shorter and comparatively broader perianth tube, often more or less campanulate, with much shorter filaments included within the tube. It is more closely allied to *I. marginifolia* from which it differs in having the perianth tube slightly longer, nearly always shortly exserted from the bract, the stamens connivent round the style with shorter filaments nearly always included in the tube and the anthers usually shorter and included or only partly exserted.

There is no doubt that the amount of rainfall and ecological conditions have played an important part in the development of *I. rapunculoides* and its varieties. Typical plants matching the type figure occur in the vicinity of Calvinia, in what Mr. J. Acocks has termed "False succulent karoo", but in adjoining "western mountain karoo" vegetation the perianth tube shows a tendency to become more elongated and this form merges into the short-tubed form of var. *namaquana*. Some of the plants from the western mountain karoo type of vegetation in the Calvinia Division match the one figured by Ker in the Botanical Magazine as *I. capillaris* var. *stricta* (t. 617), which differs from the type in having shorter, more erect 1-flowered branchlets. In the form from the Kamiesberg the stamens are longer than usual, the filaments 4—6 mm. long and anthers 3—6 mm. long, the former included in the tube and the latter usually half to slightly more than half exserted.

According to Delile the inflorescence flowers from the summit towards the base but there is nothing unusual in the flowering of this species which is typical of the genus and the family. The flowers of the terminal spike open first, from the base upwards, followed successively by the lateral spikes, those near the top of the stem flowering before the lower ones. The impression that the flowering differs in *I. rapunculoides* is due to the fact that the fairly numerous 1—3-flowered spikes are borne on very short branchlets.

Var. **robusta** Lewis var. nov.

Plantae quam var. *rapunculoides* altiores robustiores, foliis 4—5 et spicibus terminalibus et lateralibus ad 6-floris.

Cormus 2—2·5 cm. diam., tunicis subrobustis plerumque in collo circa 5 cm. longo productis, compositis. *Caulis* virgatus, 55—75 cm. altus, ramulis pluribus brevibus suberectis vel erectis 2—6-floris. *Folia* 4—5 (raro 6), quam caulis multo breviora, 2—3 basalia lanceolata vel ensiformia ad 1·6 cm. lata, varietati *rapunculoides* similia sed robustiora, aliquid coriacea. *Flores* pallide lilacino-rosei, varietati *rapunculoides* similes sed interdum paulo majores, tubo ad 1 cm. longo et segmentis ad 2 cm. longis, 9 mm. latis.

Plants taller and more robust than var. *rapunculoides*, with 4—5 leaves and the terminal and lateral spikes up to 6-flowered.

Corm 2—2·5 cm. diam.; tunics moderately coarse, usually extending up in a neck about 5 cm. long. *Stem* virgate, 55—75 cm. high, with several short suberect or erect 2—6-flowered branchlets. *Leaves* 4—5 (rarely 6), much shorter than the stem, the 2—3 basal lanceolate or ensiform, up to 1·6 cm. wide, as in var. *rapunculoides* but firmer and somewhat coriaceous. *Flowers* pale mauve-pink, as in var. *rapunculoides* but sometimes slightly larger, the tube up to 1 cm. long and lobes up to 2 cm. long and 9 mm. wide.

Holotype. *Lewis* 2503 in South African Museum Herb., National Botanic Gardens, Kirstenbosch.

Stony dolerite slopes in the Calvinia Division, western karoo vegetation.

Flowering period. September—October.

CALVINIA. Moordenaarspoort, near Agter Hantamsberg, 26 miles N.E. of Calvinia, *Lewis* 2503 (BOL, PRE, SAM); near Elandskop, Agter Hantam, c. 2,500 ft., *Acocks* 19038 (PRE).

Although this variety was found within a few hundred yards of var. *rapunculoides* it appeared so distinct that at first I was inclined to think that they were separate species, but after observing it in cultivation I came to the conclusion that the difference in soil had had a marked effect on its growth and that it was only a variety of *I. rapunculoides*. The var. *rapunculoides* was growing in sandy alluvial soil near a stream while var. *robusta* was on hill slopes, in hard gravel soil in pockets among dolerite rocks.

Var. **flaccida** Lewis var. nov.

A varietate *rapunculoides* foliis flaccidis longioribus erectioribus, perianthii tubo paulo longiore et segmentis angustioribus, distinguitur.

Plantae quam var. *rapunculoides* minus robustae, corme ad 1 cm. diam. *Folia* longiora angustiora, plus minusve erecta, flaccida, plerumque minus 1 cm. lata. *Spicae* 1—5-florae, rachide capillari valde flexuoso,

spica terminali saepe declinata. *Bractea* 6—8 mm. longa, plus minusve papyracea, alba vel parte dimidia superiore pallide brunnea. *Flores* albi vel subcaerulei vel pallide lilacini; *perianthii tubus* e bractea bene exsertus, 0·8—1·3 cm. longus, in faucibus circa 5 mm. diam.; *segmenta* 0·8—1·4 cm. longa, 2·5—4 mm. lata. *Filamenta* 2—3 mm. longa; antherae 2·5—4 mm. longae.

Distinguished from var. *rapunculoides* by its longer, more erect and flaccid leaves, and flowers with a slightly longer and narrower tube and narrower lobes.

Plants less robust than var. *rapunculoides*, the corm not more than 1 cm. diam. *Leaves* longer and narrower, more or less erect, flaccid, usually less than 1 cm. wide. *Spikes* 1—5-flowered, with a very flexuose capillary rachis, the terminal spike often declinate. *Bract* 6—8 mm. long, more or less papyraceous, white or the upper half pale brown. *Flowers* white, bluish or very pale mauve; *perianth tube* well exserted from the bract, 0·8—1·3 cm. long, about 5 mm. diam. at the throat; *lobes* 0·8—1·4 cm. long, 2·5—4 mm. wide. *Filaments* 2—3 mm. long; anthers 2·5—4 mm. long.

HOLOTYPE. *Schlechter* 8432 in the Bolus Herbarium.

Hills and lower slopes of mountains, often in shady places among rocks in sclerophyllous bush.

Flowering period. July—September.

CALVINIA. About 4 miles N. of Nieuwoudtville on Loeriesfontein road, c. 2,000 ft., *L. Bolus* (BOL 19589); Willemsrivier, *Leipoldt* 803 (SAM).

VANRHYNSDORP. Wiedourivier, between Vanrhynsdorp and Klaver, *Lewis* 1980 (SAM).

CLANWILLIAM. *Marloth* (BOL 10619); near Clanwilliam, *Lewis* (BOL 26904), 1981 (SAM); Olifants River Valley, *Steyn* 497 (NBG); *Penther* 567 (Z), 669 (M, Z); 9 miles S. of Clanwilliam, *Lewis* 5210 (NBG); Boschkloof, *Schlechter* 8432 (BM, BOL, G, L, K, PRE, S, Z).

MONTAGU. Montagu Baths, *Page* (BOL 26905).

LAINGSBURG. Ngaap Kop, 3,800 ft., *Compton* 9272 (NBG).

OUDTSHOORN. Kleinfontein, *Thorne* (SAM 51702).

As in the case of var. *robusta*, soil, aspect and moisture appear to have played an important part in the development of this variety, with its much softer, somewhat narrower and more erect leaves, and more delicate slightly longer and narrower flowers. It occurs in a different type of vegetation from the two previous varieties, in areas with a slightly higher rainfall.

Var. **namaquana** (L. Bolus) Lewis stat. nov. *I. namaquana* L. Bolus, S. Afr. Gard. 21: 368. 1931.

Distinguished from var. *rapunculoides* by its larger bracts and flowers, the perianth tube up to 2 cm. long with the lower third or half cylindrical.

Corm 1—2·5 cm. diam. *Stem* 35—70 cm. high, with 2—7 very short slightly patent to erect straight or flexuose 1—3-flowered branchlets. *Leaves* linear to ensiform, 0·4—1·8 cm. wide. *Bract* 0·8—1·2 cm. long. *Flowers* purple, pale mauve or blue, the tube usually yellowish; *perianth tube* 1·2—2 cm. long, the lower third or half cylindrical and upper part broadly infundibuliform or campanulate, 6—8 mm. diam. at the throat; *lobes* 1·4—2 cm. long, 5—7 mm. wide, as long as the tube or slightly shorter or longer. *Filaments* 3—5 mm. long; anthers 4—4·5 mm. long.

HOLOTYPE. *Bolus* HNAA 698, in the Bolus Herbarium.

Mostly on dry rocky hill slopes in western mountain karoo vegetation but sometimes in adjoining sclerophyllous bush.

Flowering period. August—September.

NAMAQUALAND. Klipfontein, c. 3,000 ft., *Bolus* HNAA 698 (B, BOL, G, K, PRE, SAM, Z); *Marloth* 12678 (PRE); *Compton* 5411 (BOL, NBG); near Steinkopf, *Herre* (STE 11846 in BOL, K); *Lewis* 5494 (NBG).

CALVINIA. Lokenberg, *Esterhuysen* 5755 (BOL, PRE); Nieuwoudtville, *Leipoldt* 822 (BOL); *Buhr* (BOL 20428, K); 4 miles W. of Nieuwoudtville near top of Vanrhyns Pass, *Barker* 6454 (NBG); *Lewis* 2287 (SAM); Bokkeveld, *Marloth* 7656 (PRE); Willemsrivier, *Leipoldt* 793 (SAM); Oorlogs Kloof road, 22 miles E. of Nieuwoudtville, *Lewis* 2502 (SAM); *Barker* 6543 (NBG).

SUTHERLAND. Sneeukrans, *Marloth* 9876 (PRE).

CLANWILLIAM. Citadel Kop, *Compton* 24239 (NBG); road from Pakhuis to Wupperthal, *Leipoldt* (BOL 20772, K); Pakhuis, *Esterhuysen* 5915 (BOL); Wupperthal, *Marloth* 7550 (PRE).

WORCESTER. Between Osplaats and Tunnel Sidings, 2—3,000 ft., *Rogers* 16743 (BOL, Z); near top of Hex River Pass, *Hardy* 48 (PRE).

LAINGSBURG. 19 miles N. of Matjesfontein, c. 3,000 ft., *Acocks* 18440 (PRE).

WITHOUT LOCALITY. *Drege* 2640 b (L).

Due to a printing error in the original description, the type number of *I. namaquana* was given as 648 instead of 698.

Var. *namaquana* occurs mainly in western mountain karoo vegetation, the typical form in a small isolated patch near Steinkopf, but in the Calvinia, Clanwilliam and other districts it occurs also on the margins of adjoining sclerophyllous bush, and in this type of vegetation the plants are much lanker and less robust, with softer, longer and narrower leaves.

The typical Namaqualand form, with its ensiform leaves and long-tubed purple or bluish mauve flowers appears quite distinct from var. *rapunculoides*. Superficially it resembles *I. latifolia*, but it differs in having a wider perianth tube and much shorter stamens entirely or almost entirely included in the tube, also shorter style branches.

The form which occurs in the Calvinia and Clanwilliam Divisions is less robust than the typical, with narrower leaves and paler flowers, usually pale blue or mauve, and in the Calvinia Division this merges into var. *rapunculoides*, with a few intermediates which are difficult to place as the perianth tube is slightly shorter than in var. *namaquana* but longer than is normal in var. *rapunculoides*.

Var. **subpendula** Lewis var. nov. *I. scariosa* var. *longifolia* Baker Handbk. Irid. 165. 1892 et Fl. Cap. 6: 83. 1896, pro parte.

A varietate *rapunculoides* ramis paucioribus longioribus gracillimis saepe plus minusve pendulis (in forma alpina brevioribus vel interdum defectis), floribus campanulatis tubo latiore, distinguitur.

Cormus 1—1·5 cm. diam., tunicis e fibris tenuibus reticulatis compositis. *Caulis* 25—55 cm. altus, filiformis, ramis 1—5 capillaribus plerumque 5—8 cm. longis (in forma alpina brevioribus vel interdum defectis), saepe plus minusve pendulis, infimo interdum ramulis secundariis 1—2. *Folia* 2—4, 2—3 inferiora linearia vel lanceolata, patentia vel suberecta, subrobusta marginibus et nervo medio leviter prominentibus, 10—30 cm. longa, 2—7 mm. lata (raro 1 mm.), supremum longius parte dimidia inferiore vel amplius vaginanti et lamina libera sat longa. *Spica* laxe vel sat dense 2—7-flora. *Bractea* oblonga vel subquadrangularis, 5—7 mm. longa, tridentata vel breviter tricuspidata, saepe apicem versus minute brunneo-punctata. *Flores* campanulati, albi plerumque extus pallide lilacini vel roseo-lilacini vel subcaerulei, tubo et parte dimidia inferiore segmentorum subtiliter purpureo-nervata; *perianthii tubus* 0·9—1·3 cm. longus, in faucibus 0·6—1 cm. diam.; *segmenta* supra medium patentia, oblonga vel oblongo-ovata tubo circa aequantia vel leviter breviora vel longiora, 4—6 mm. lata.

Differs from var. *rapunculoides* in having fewer and longer very slender, often more or less pendulous branches (shorter or sometimes wanting in the high mountain form), and the flowers distinctly campanulate with a wider tube.

Corm 1—1·5 cm. diam.; tunics of fine reticulate fibres. *Stem* 25—55 cm. high, filiform, with 1—5 capillary branches usually 5—8 cm. long (in alpine form shorter or sometimes wanting), often more or less pendulous in living plants, straight and patent to erect when dried, the lowest sometimes bearing 1 or 2 secondary branchlets. *Leaves* 2—4, the lower

2 or 3 linear or lanceolate, 10—30 cm. long, 2—7 mm. wide (rarely 1 mm.), patent or suberect, fairly firm with the margins and mid-rib slightly prominent; upper leaf longer than others, half or more than half sheathing with a fairly long free blade. *Spike* laxly to fairly closely 2—7-flowered, the terminal spike often pendulous like the branches. *Bract* oblong or subquadrangular, 5—7 mm. long, tridentate or shortly tricuspidate, often minutely speckled with brown at the apex. *Flowers* campanulate, white usually tinged with pale mauve outside, pinkish mauve or pale blue, the tube and lower half of the lobes finely veined with purple outside; *perianth tube* 0·9—1·3 cm. long, 0·6—1 cm. diam. at the throat; *lobes* patent above the middle, oblong or oblong-ovate, about as long as the tube or slightly shorter or longer, 4—6 mm. wide. *Androecium* and *gynaecium* as in var. *rapunculoides*.

HOLOTYPE. *Leipoldt* 3026 in the Bolus Herbarium.

Marshy or sandy ground on mountain slopes.

Flowering period. October—December.

CLANWILLIAM. Between Groot Rivier and Elands Kloof, *Leipoldt* 3026, 3058 (BOL); Cedarberg, *Thode* A 2079 (PRE).

CERES. Near Ceres, *Bolus* 2621 (BOL, SAM); top of Michells Pass, *Marloth* 10692 (PRE); Michells Peak, 5,000 ft., *Esterhuysen* 14795 (BOL); Conical Peak, *Stokoe* (SAM 55766); Matroosberg, near Laaken Vlei, *Phillips* (SAM 11876); Gydouw, *Leipoldt* 3057 (BOL); foot of Skurfteberg, *Esterhuysen* 21869 (BOL); Elands Kloof, *Barker* 3094 (BOL, NBG); near Waboomsrivier, *Lewis* 2752 (SAM).

TULBAGH. Steendal, *Pappe* (SAM 20937); Great Winterhoek, c. 4,600 ft., *Phillips* 1874 (SAM); Sneeugat Valley, *Thorne* (SAM 50404); Windheuvel, Koedoes Mts., *Burchell* 1285 (K); Tulbagh, *Ecklon* and *Zeyher* 94 (BOL, K. PRE, Z).

WORCESTER. Waaihoek Mt., 5,000 ft., *Esterhuysen* 8344 (BOL); Milner Peak, Hex River Mts., 6,000 ft., *Esterhuysen* 14234 (BOL); same, shale band above Buffels Dome, 5,500 ft., *Esterhuysen* 9327 (BOL); Matroosberg, 7,000 ft., *Marloth* 2266 (PRE).

This very distinct variety, with hair-like often pendulous branches and campanulate flowers, has the appearance of a *Dierama*. Except in the alpine form the branches are considerably longer than in the varieties described above and although they always appear straight in herbarium specimens they are very often more or less pendulous in living plants. The form from high altitudes flowers from November to December and the plants are usually smaller, with only two leaves and usually not more than one or two short erect branchlets.

In the Flora Capensis Baker cited two collections under *I. scariosa* var. *longifolia*, the first, *Bolus* 2621, being the variety described above but the second, *Bolus* 2487, from Avontuur, is *I. orientalis* L. Bolus. One of the collections he cited under *I. scariosa, Ecklon* and *Zeyher* 94, is this variety, and the correct locality is Tulbagh, not "Karoo near Gouritz River."

Var. **rigida** Lewis var. nov.

A varietate *rapunculoides* ramis paucioribus robustioribus paulo vel valde longioribus, perianthii tubo longiore et segmentis brevioribus latioribus differt.

Caulis 15—60 cm. altus, spica terminali flexuosa saepe plus minusve declinata, ramis 1—5 rigidis patentibus parte dimidia inferiore interdum horizontali superne plerumque caulem versus incurva. *Folia* 3, varietati *rapunculoides* similia. *Spicae* sat dense 3—7-florae, interdum secundae. *Bractea* varietati *rapunculoides* similis. *Flores* rosei vel lilacini vel caerulei vel purpurei, perianthii tubo plerumque luteo 1—1·5 cm. longo in faucibus 0·6—1 cm. diam.; *segmenta* oblonga vel suborbicularia obtusa, 0·8—1·4 cm. longa, 5—8 mm. lata, quam tubus leviter breviora, supra basin patentia.

Differs from var. *rapunculoides* in having fewer branches which are slightly to much longer and more rigid, the perianth tube slightly longer and wider, and comparatively shorter and wider lobes.

Stem 15—60 cm. high, with the terminal spike flexuose, often more or less declinate, and 1—5 stiff patent branches with the lower half sometimes horizontal and upper part usually curved in towards the stem, having a zig-zag appearance. *Leaves* 3, as in var. *rapunculoides*. *Spikes* fairly closely 3—7-flowered, sometimes secund. *Bract* as in var. *rapunculoides*. *Flowers* pinkish, pale mauve, blue or purplish, the tube usually yellow; *perianth tube* 1—1·5 cm. long, 0·6—1 cm. diam. at the throat; *lobes* oblong or suborbicular, obtuse, 0·8—1·4 cm. long, 5—8 mm. wide, slightly shorter than the tube, patent above the base. *Androecium* and *gynaecium* as in var. *rapunculoides*.

HOLOTYPE. *MacOwan* HAA 1653 in the South African Museum Herb., National Botanic Gardens, Kirstenbosch.

Sandy flats and valleys in the Clanwilliam, Ceres and Worcester Divisions.

Flowering period. September—October.

CLANWILLIAM. Matjes River Valley, 2 miles from top of Uitkyk Pass, *Gillett* 4108 (BOL, PRE);Welbedacht Kloof, *Stokoe* (SAM 55666).

CERES. Cold Bokkeveld, *Marloth* 10610, 10613 (PRE); *Lewis* 2661 (SAM); South Cold Bokkeveld, *Bond* 645 (NBG); Gydouw Pass, *Marloth* 12965 (PRE); *Lewis* NBG 2079/36 (BOL): *Leipoldt* 3023 (BOL, NBG, PRE, SAM); 3821 (BOL, PRE); Jakhals Nest, *Barker* 3033 (NBG).

WORCESTER. Hex River Valley, *MacOwan* HAA 1653 (G, K, SAM, Z) (in BOL under *Guthrie* 3077).

The flowers of this variety are very similar to those of var. *subpendula* but the plant differs in having a more rigid habit, with stiff flexuose branches and a somewhat zig-zag appearance. Its habit is that of *I. latifolia* var. *curviramosa* but it is readily distinguished by its campanulate flowers which have a much wider perianth tube and short stamens not exserted from the tube.

4. **I. brunneobractea** Lewis sp. nov.

Cormus ovoideus vel subglobosus, 0·7—1 cm. diam., tunicis e fibris subrobustis parallelis erectis supra medium confluentibus et plus minusve reticulatis, compositis. *Caulis* gracilis, 25—45 cm. altus, plerumque spica terminali declinata, simplex vel ramulis brevissimis 1—2 patentibus flexuosis. *Vaginae basales* 2, acutae, ad 9 cm. longae, molles. *Folia* 3, 2 inferiora linearia vel lineari-lanceolata, erecta vel infimum falcatum, circa ad medium caulis attingentia, 2—5 mm. lata, subrobusta nervo medio et marginibus leviter prominentibus, supremum longius, vaginans lamina libera 0·5—5 cm. longa. *Spica* brevis, terminalis et laterales dense 2—5-flora. *Bractea* ovata vel oblonga, tridentata, 0·7—1 cm. longa, castanea lucida mollis, interdum apice lacerata; *bracteolae* 2-nervatae bidentatae. *Flores* campanulati, gilvi vel interdum lobis exterioribus pallide lilacinis; *perianthii tubus* e bractea non vel breviter exsertus, basin versus cylindricus, superne campanulatus, 5—7 mm. longus; *segmenta* oblonga obtusa, 1—1·5 cm. longa, 5—8 mm. lata. *Stamina* in perianthii tubo medium versus orta, filamentis exsertis decurrentibus, 6—8 mm. longis, et antheris lineari-oblongis sagittatis, 4—5 mm. longis. *Ovarium* rotundum, 2 mm. longum: stylus ad medium antherarum attingens, ramis linearibus conduplicatis circa 2 mm. longis.

Corm ovoid or subglobose, 0·7—1 cm. diam.; tunics of moderately coarse fibres, vertical below, becoming confluent and more or less reticulate above. *Stem* slender, 25—45 cm. high, the terminal spike often declinate, simple or with 1—2 short patent flexuose branchlets. *Basal sheaths* 2, acute, up to 9 cm. long, soft and often partly or entirely disintegrated at time of flowering. *Leaves* 3, the 2 lower linear or linear-lanceolate, erect or the lower falcate, about half as long as the stem, 2—5 mm. wide, fairly firm with the mid-rib and margins slightly prominent; third leaf slightly or much longer, sheathing with a short free blade 0·5—5 cm. long. *Spike* short, the terminal and lateral closely 2—5-flowered. *Bract* ovate or oblong, 0·7—1 cm. long, tridentate, chestnut-brown, shining, usually with 3 dark veins, becoming torn at the apex as the flower opens; *bracteoles* 2-veined, bidentate. *Flowers* campanulate, cream-coloured or the outer lobes occasionally pale mauve, the tube yellow inside; *perianth* *tube* not or very little exserted from bract, cylindrical at the base, campanulate above, 5—7 mm. long; *lobes* oblong, obtuse, 1—1·5 cm. long, 5—8 mm. wide. *Stamens* arising near middle of tube, exserted, the filaments decurrent, 6—8 mm. long; anthers linear-oblong, sagittate, 4—5 mm. long. *Ovary* rotund, 2 mm. long; style reaching to middle of anthers, the branches linear, conduplicate, about 2 mm. long, minutely papillose-fimbriate towards the apex.

HOLOTYPE. *Barker* 9555 in the Compton Herbarium, Kirstenbosch.

Marshy places near the western borders of the Calvinia Division at about 2,000—3,000 ft. alt.

Flowering period. September—October.

CALVINIA. 5 miles N. of Nieuwoudtville on Grasberg road, *Barker* 9555 (NBG); Nieuwoudtville, *Leipoldt* 790 (BOL); Nieuwoudtville and Groenrivier, *Leipoldt* 803 (BOL); Bokkeveld above Vanrhynsdorp, *Marloth* 13341 (PRE); Willemsrivier, *Leipoldt* 793 (SAM).

The shining chestnut-coloured bracts, sometimes torn at the apex, distinguish this species from all others in the section. It is allied to *I. capillaris* but as well as the different bracts it has slightly wider leaves and the spikes are more compact and usually have more flowers.

5. **I. latifolia** De la R. Descr. Pl. Nov. 22. 1766; Klatt, Abh. Naturf. Ges. Halle 12: 397 et Erganz. 63. 1882. *I. incarnata* Jacq. Ic. t. 282. 1786—93 et Coll. Suppl. 13. 1796; Dur. & Schinz, Consp. Fl. Afr. 5: 184. 1895. *I. aulica* Ait. Hort. Kew. 1: 57. 1789. *I. capillaris* L. f. var. *incarnata* (Jacq.) Ker, Bot. Mag. 617. f. inf. 1803. *I. capillaris* var. *aulica* (Ait.) Ker, Bot. Mag. t. 1013. 1807. *I. scariosa* Thunb. Fl. Cap. 243. 1811; Baker, Handbk. Irid. 165. 1892 et Fl. Cap. 6: 83. 1896, pro parte. *I. phlogiflora* Red. Lil. t. 432. 1816. *I. capitata* var. *stellata* Andr. Bot. Rep. t. 232. 1802. *I. stellata* (Andr.) Klatt, Abh. Naturf. Ges. Halle 12: 396 et Erganz. 62; Dur. & Schinz, 1. c. 186. *Hyalis latifolia* (De la R.) Salisb. Trans. Hort. Soc. 1: 317. 1812. *H. aulica* (Ait.) Salisb. 1. c. 318. *Morphixia aulica* (Ait.) Ker, Gen. Irid. 107. 1827. *M. incarnata* (Jacq.) Ker, 1. c *Geissorhiza latifolia* (De la R.) Baker, Journ. Linn. Soc. Bot. 16: 94. 1877 Handbk. Irid. 156 et Fl. Cap. 6: 72; Dur. & Schinz, 1. c. 179. *Tritonia latifolia* (De la R.) N.E. Br. Kew Bull. 1929. 135.

KEY TO THE VARIETIES

1. Leaves 2—4 mm. wide or occasionally to 5 mm... .. .. *angustifolia*
1. Leaves 0·5—2 cm. wide.
    2. Stem and branches straight or nearly so, seldom slightly curved or flexuose .. .. *latifolia*
    2 Branches, and often the terminal spike, distinctly curved or flexuose.

3. Branchlets usually several, very short; occurs only in Namaqualand . . . . *ramulosa*
3. Branchlets usually 1—3; does not occur in Namaqualand.
  4. Branchlets curved with the spikes erect or curved in towards the stem; flowers usually 2 cm. or more long *curviramosa*
  4. Branchlets and terminal spike much twisted and more or less declinate; flowers usually less than 2 cm. long . . *parviflora*

Var. **latifolia**

Corm ovoid or subglobose, 1·5—2·5 cm. diam.; tunics of fairly coarse dark brown fibres, vertical below becoming reticulate above the middle. *Stem* 15—50 cm. high (occasionally to 60 cm.), slender to moderately stout, usually with 1—3 short suberect or patent branches. *Basal sheaths* 2, the lower colourless, 1—3 cm. long, the upper brownish towards the apex, up to 10 cm. long, acute. *Leaves* 3, firm, the 2 basal lanceolate or ensiform, acute or subacute, 0·8—2 cm. wide, several-veined with the mid-rib and margins slightly to distinctly prominent and cartilaginous, the lower falcate or straight and suberect or erect, 8—28 cm. long, the second straight, suberect or erect, as long as the lower or up to 10 cm. longer; cauline leaf longer than the 2 basal, partly to almost entirely amplexicaul, reaching to middle of stem or above, sometimes up to the inflorescence. *Spike* laxly to fairly closely 3—7-flowered, the rachis more or less flexuose. *Bract* oblong or sometimes obovate, 0·8—1·4 cm. long, tridentate, tricuspidate or with a short cusp and 2 short teeth, usually pellucid and brownish with 3 dark veins, sometimes purplish or almost colourless; *bracteoles* bicarinate, bicuspidate. *Flowers* pale mauve, pinkish mauve or pale to bright pink or magenta, usually green or yellowish green inside the tube; *perianth tube* 1—2 cm. long, infundibuliform, the upper half gradually expanded from about 1 mm. diam. to 4—7 mm. diam. at the throat; *lobes* patent, equal, oblong, obtuse, 1·1—2 cm. long, 5—9 mm. wide, as long as the tube or slightly shorter or longer. *Stamens* arising below the throat, the filaments decurrent on the tube, well exserted, 0·8—1·2 cm. long, connivent round the style; anthers linear-oblong, 4—5 mm. long. *Ovary* oblong or rotund, about 3 mm. long; style reaching to middle or top of anthers or shortly above them, the branches recurved, oblanceolate, conduplicate, 2—3 mm. long, with the upper third minutely ciliate.

HOLOTYPE. *Burmann* in Herb. Delessert, Geneva.

Sandy flats and mountain slopes in the Ceres and adjoining Divisions.

Flowering period. September—October.

CALVINIA. Between Oorlogs Kloof and Papkuilsfontein, *Leipoldt* 3020, 3022 (BOL).

CLANWILLIAM. Elands Kloof, *Thomas* (NBG).

CERES. Cold Bokkeveld, *Thunberg* (UPS, type of *I. scariosa*);

Leipoldt (BOL 26909); *Marloth* 10608 (PRE); *Ingram* (K); Cold Bokkeveld, 3 miles S. of Leeuwrivier, *Lewis* 2512 (PRE, SAM); Cold Bokkeveld, 35 miles N. of Ceres, *Middlemost* 1727 (NBG); Gydouw, *Leipoldt* 3024 (BOL), 4070 (NBG, PRE); 7 miles W. of Gydouw Pass, *Hutchinson* 1048 (K); De Keur, *Compton* 9716 (NBG); Prince Alfreds Hamlet, *Olivier* (NBG); *Lewis* 2660 (SAM); *Johnson* 494 (NBG); Groenfontein, *Barker* 3045 (NBG); Theronsberg, *Marloth* 3318 (PRE); road to Theronsberg, *Marloth* 6164 (PRE); Laaken Vlei, *Barker* 1569 (NBG); *Compton* 12063 (NBG); Hottentots Kloof, *Barker* 1563, 3021 (NBG); between Karoopoort and Ceres, *Dymond*, NBG 1966/33 (K, PRE); near Ceres, *Barker* 1568 (NBG); Ceres Wild Flower Show (BOL 14278, K); *Barker* 309 (NBG); *Lewis* (SAM 61741, 61742); *Lavis* (BOL 26907, 26913); Karoopoort, *L. Bolus* (BOL 19887, 26908).

WORCESTER. Tafelberg, 3,000 ft., *Pillans* (BOL 14141); Hex River Valley, *Zinn* (SAM 67322); Hex River, 1,000 ft., *Drege* 581 (G, P).

WITHOUT LOCALITY. *Burmann* (G); *Drege* 3499 a (P); *Pappe* (S); *Zeyher* 581 (S, drawing and flowers in Klatt's Herb.); *Brehm* 824 (M).

Some idea of the confusion about this species can be gathered from the nomenclature. Baker, who knew it only from the original description, transferred *I. latifolia* to *Geissorrhiza*, as a doubtful species, while N. E. Brown, who examined the type, stated that it was a distinct species of *Tritonia* which he could not match at Kew. When I first saw the type in Geneva in 1949 I noted that it was the same as the species known in South Africa as *I. incarnata* Jacq. (syn. *I. scariosa* Thunb.). Since then, through the courtesy of Prof. C. Baehni, Director of the Jardin Botanique in Geneva, the type has been sent here for comparison with material from other herbaria and there is no doubt at all that *I. incarnata* Jacq. and *I. scariosa* Thunb. are the same as *I. latifolia* De la R., and the name *I. latifolia* being the first by which it was known, must therefore be restored to the species. In Kew Herbarium there are some specimens from the Ceres Wild Flower Show (Bolus Herb. No. 14278), on which N. E. Brown noted "exactly matches type of *I. scariosa* Thunb." As well as having seen Thunberg's type, I have compared Bolus Herbarium No. 14278 with the type of *I. latifolia* and found them to be an excellent match.

De la Roche described the stem as simple but in the type it is just possible to see a branch enclosed within the cauline leaf—the specimen was picked before it was far enough developed to emerge.

In addition to the varieties described below, all of which differ fairly markedly from var. *latifolia* and from each other, there are a few distinct local forms of the var. *latifolia*. One of these, from Prince Alfreds Hamlet, has longer more filiform branches than usual and pale mauve, sometimes almost white, flowers with a shorter tube than usual. Another, with smallish pink flowers with the tube greenish yellow and shorter than in the type, matches the plant figured by Andrew in 1802 as *I. capitata* var. *stellata* (Andr. Bot. Rep. t. 232). Although the perianth tube can be seen to be funnel-shaped in Andrew's figure, it was taken to be cylindrical by both Klatt and Baker. The former raised it to specific status as *I. stellata* (Andr.) Klatt, but one of the specimens I have seen to which he gave this name is *I. patens* Ait. In the Flora Capensis Baker cited *I. capitata* var. *stellata* as a synonym of *I. flexuosa* L. (p. 78), and in the same work placed *I. stellata* (Andr.) Klatt as a variety of *I. ovata* Klatt (p. 82)!

Baker cited *I. striata* Vahl. Enum. 2: 65 (1806) as a synonym of *I. scariosa* but from Vahl's description it is doubtful if this is correct, and as his type has not been seen its identity remains uncertain.

Var. **angustifolia** Lewis var. nov.

A var. *latifolia* foliis angustioribus, plerumque minus 5 mm. latis, distinguitur.

Cormus 0·6—1·2 cm. diam., tunicis e fibris tenuibus reticulatis compositis. *Folia* 3—4, raro 5, linearia vel lineari-lanceolata, plerumque 2—4 mm. lata, raro ad 5 mm. Planta ceteroqui var. *latifoliae* similis sed caule saepius simplici, spica interdum 1—2-flora et bracteis 5—8 mm. longis.

Distinguished from var. *latifolia* by its narrower leaves, usually less than 5 mm. wide.

Corm 0·6—1·2 cm. diam., tunics of fine reticulate fibres. *Leaves* 3—4, rarely 5, linear or linear-lanceolate, usually 2—4 mm. wide, occasionally to 5 mm. Plant otherwise as in var. *latifolia* but the stem more often simple, the spike sometimes 1- or 2-flowered and the bracts 5—8 mm. long.

HOLOTYPE. *Pillans* 9790 in the Bolus Herbarium.

Fairly high altitudes on mountains in the Clanwilliam, Tulbagh, Ceres, Paarl and Stellenbosch Divisions.

Flowering period. October—December or early January.

CLANWILLIAM. Cedarberg, *Thode* A 2080 (PRE); *Jackson* (NBG); *Taylor* 1850 (NBG); Elands Kloof, *Lewis* (BOL 26940).

CERES. Witzenberg, east face, *Pillans* 9790 (BOL); Skurfteberg Pass, *Compton* 22277 (NBG).

TULBAGH. Witzenberg Vlakte, *Leighton* 2295 (BOL); slopes of Witzenberg, about 5,000 ft., *Phillips* 1875 (SAM); Tulbagh, *Pappe* (SAM 20937).

PAARL. French Hoek, mountains, *Esterhuysen* 11199 (BOL); Wemmershoek Peak, 5,500 ft., *Esterhuysen* 11268 (BOL); *Lewis* 853 (SAM); mountains S. of Wemmershoek, *Andreae* 736 (PRE).

STELLENBOSCH. Victoria Peak, 4,500 ft., *Esterhuysen* 9763 (BOL).

Without Locality. *Thunberg* (S, named *I. tenuifolia* Vahl by Klatt).

A slender late-flowering alpine variety. Plants from the Bredasdorp Mts., *Hafstrom* and *Acocks* 2073 (S, PRE), are nearest to this variety but the bracts are shorter, the perianth tube is more slender than usual, about 3 mm. diameter at the throat, and there is a dark circular ring of colour in the middle of the flower. When more material becomes available it might prove to be a new species.

Var. **curviramosa** Lewis var. nov.

A var. *latifolia* ramis brevibus rigidis curvis distinguitur.

Caulis plerumque 10—30 cm. altus (interdum ad 40 cm.), fere semper ramis brevibus rigidis parte dimidia inferiore patente et spica erecta vel caulem versus incurva, rachide spicae terminalis etiam saepe ramorum valde flexuoso. *Folia* var. *latifoliae* similia sed breviora, interdum obtusa vel subobtusa. *Bractea* ad 1 cm. longa. *Flores* albi vel pallide lilacini segmentis sat conspicue nervatis, vel rubido-purpurei, plerumque quam var. *latifolia* minores, perianthii tubo ad 1·4 cm. longo (plerumque minus) et segmentis ad 1·5 cm. longis circa tubo aequantibus.

Distinguished from var. *latifolia* by its stiff short curved branches.

Stem usually 10—30 cm. high (sometimes up to 40 cm.), almost always branched, the branches short and stiff with the lower half patent and the spike upcurved and erect or curved in towards the stem, the rachis of the terminal spike, often the branches also, very flexuose. *Leaves* as in var. *latifolia* but shorter, sometimes obtuse or subobtuse. *Bract* up to 1 cm. long. *Flowers* whitish or pale mauve with the lobes somewhat conspicuously veined, or magenta, usually slightly smaller than in var. *latifolia*, the perianth tube up to 1·4 cm. long (usually less) and lobes up to 1·5 cm. long, about as long as the tube.

Holotype. *Barker* 7469 in the Compton Herbarium, Kirstenbosch.

Sandy flats and mountain slopes in the Ceres, Worcester, Montagu and Laingsburg Divisions.

Flowering period. September—October.

CERES. Gydouw, *Leipoldt* 3025 (BOL); 8 miles N. of Ceres, *Johnson* 492 (NBG); Cold Bokkeveld, *Marloth* 10624 (PRE); Ceres Wild Flower Show (BOL 26911); *Barker* (BOL).

WORCESTER. Between Ouberg Pass and Touwsrivier, *Dymond*, NBG 1965/33 (BOL, K, PRE, SAM).

MONTAGU. Rabiesberg, *Compton* 5680 (NBG); *Lewis* (BOL 26910); Eendrag, 4,000 ft., *Compton* 18526 (NBG); *Lewis* 1606 (SAM); Montagu Div., *Leipoldt* (BOL 21831, K).

LAINGSBURG. Tweedside, *Barker* 7469 (NBG); *Compton* 3143 (BOL, K); *Lewis*, NBG 2705/32 (BOL, K); Witteberg, *Leighton* 227 (BOL);

same, 4,500 ft., *Compton* 13987, 15200 (NBG); Elandsfontein, Witteberg, *Compton* 3810 (BOL, NBG); Seven Weeks Poort, north end, 3,000 ft., *Wurts* 1165 (NBG); same, 4—5,000 ft., *Phillips* 1545 (BOL, SAM).

This variety, which occurs in dry areas mostly in or near the borders of the Karoo, is easily recognised by its stiff curved and often flexuose branches and slightly smaller flowers. The plants are usually shorter and sturdier than in var. *latifolia*, and in dry seasons are sometimes only about 10 cm. high, though even these dwarf plants are almost invariably branched. There are two distinct colour forms, one with dark magenta and the other with pale mauve or whitish flowers usually with somewhat conspicuous darker veins on the lobes.

Var. **parviflora** Lewis var. nov.

Var. *curviramosae* similis sed spica terminali ramisque plus flexuosis, saepe declinatis, et floribus minoribus.

Caulis 10—20 cm. altus, spica terminali et ramis brevibus 1—2 valde flexuosis, saepe declinatis. *Flores* punicei vel violacei, odorati, 1·5—2 cm. longi (ovario incluso), perianthii tubo 6—8 mm. longo, raro e bractea non exserto.

Similar to var. *curviramosa* but the terminal spike and branches more flexuose, often declinate, and the flowers smaller.

Stem 10—20 cm. high, the terminal spike and 1—2 short branches extremely flexuose, often declinate. *Flowers* deep pink to violet, fragrant, 1·5—2 cm. long (including ovary), the perianth tube 6—8 mm. long, occasionally not exserted from the bract.

HOLOTYPE. *Compton* 5592 in the Compton Herbarium, Kirstenbosch.

Only recorded from the Karoo Garden, Whitehill.

Flowering period. August—September.

LAINGSBURG. Karoo Garden, Whitehill, 2,700 ft., *Compton* 2873 (BOL, NBG), 5592, 11208, 14840 (NBG); *L. Bolus* (BOL).

A dwarf small-flowered variety with very flexuose twisted branches. It closely resembles the dark colour form of var. *curviramosa* but the flowers are sweet-scented, "like *Freesia*", and the flowering period is a month earlier.

Var. **ramulosa** Lewis var. nov.

A var. *latifolia* ramulis pluribus brevioribus, perianthii tubo paulo breviore styli ramis brevioribus, distinguitur.

Caulis 15—70 cm. altus, plerumque 30—40 cm., ramulis pluribus brevibus patentibus vel erectis flexuosis. *Folia* var. *latifoliae* similia, 0·5—1·5 cm. lata. *Spica* sat laxe 1—3-flora, raro ad 5-flora. *Flores* purpurei vel lilacini, tubo plerumque intrinsecus viridi e bractea breviter exserto, 0·8—1 cm. longo, parte dimidia superiore aliquid subito ampliata et late infundibuliformi; *segmenta* 1·2—1·7 cm. longa, 5—8 mm. lata. *Stamina* infra fauces circa 3 mm. orta, filamentis bene exsertis 0·6—1 cm. longis et antheris 4—5 mm. longis. *Styli rami* 1—1·5 mm. longi, spathulati vel lineares apicem versus leviter ampliati et ciliati.

Distinguished from var. *latifolia* by the more numerous shorter branchlets, the slightly shorter and comparatively broader perianth tube and shorter style branches.

Stem 15—70 cm. high, usually 30—40 cm., with several short patent to erect flexuose branchlets. *Leaves* as in var. *latifolia*, 0·5—1·5 cm. wide. *Spike* fairly laxly 1—3-flowered, rarely up to 5-flowered. *Flowers* purple or mauve, the tube usually greenish inside; *perianth tube* shortly exserted from bract, 0·8—1 cm. long, the upper half somewhat abruptly expanded and broadly infundibuliform; *lobes* 1·2—1·7 cm. long, 5—8 mm. wide. *Stamens* arising about 3 mm. below throat, the filaments well exserted, 0·6—1 cm. long; anthers 4—5 mm. long. *Style branches* 1—1·5 mm. long, spathulate or linear with the apex slightly expanded and ciliate.

HOLOTYPE. *Lewis* 1372 in the South African Museum Herb., National Botanic Gardens, Kirstenbosch.

Sandy soil in broken veld or rolling granite country in Namaqualand.

Flowering period. August—September.

NAMAQUALAND. Groot Vlei, W. of Kamieskroon, *Lewis* 1372, 4439 (SAM); *Acocks* 19459 (M, NBG, PRE); *Barker* 1567, 3712 (BOL, NBG), 8411 (NBG); *Middlemost* 1647 (NBG); *Compton* 6608 (NBG); *Leighton* 1216 (BOL, PRE); between Grootvlei and Kamieskroon, *Martin* 527 (NBG); Kamieskroon, *Esterhuysen* 5711 (BOL, PRE); between Garies and Kamieskroon, *Herre* (STE 3762 in BOL); Brakdam, *Martin* 827 (NBG); N. of Darters Grave, *Barker* 6750 (NBG).

Apart from the more numerous and shorter branchlets and other characters mentioned above, the colour of the flowers in this variety, usually purple but sometimes mauve, distinguishes it from var. *latifolia*. A form of var. *curviramosa* from the Cold Bokkeveld, with deep magenta flowers and a shorter tube than usual, closely resembles var. *ramulosa* in the dried state, though the plants are almost always considerably shorter.

6. **I. leipoldtii** Lewis, Ann. S. Afr. Mus. 40: 121. 1954.

Corm globose, 1—1·4 cm. diam.; tunics of moderately fine vertical confluent fibres. *Stem* 11—25 cm. high, simple or with 1—2 short suberect branches. *Basal sheaths* 1 or 2, 1·5—4·5 cm. long. *Leaves* 3, lanceolate, somewhat coriaceous with the mid-rib and margins fairly prominent, 7—20 cm. long, 3—5 mm. wide, the lowest falcate or subfalcate, the second suberect and third erect and entirely or almost entirely sheathing. *Spike* short, closely 2—4-flowered. *Bract* ovate, 0·7—1 cm. long, tricuspidate or sometimes with a single cusp, pellucid, brownish or brownish purple, 3 or

5-veined; *bracteoles* as long as bract or slightly longer. bicarinate, shortly bicuspidate. *Perianth tube* yellow, 1—1·2 cm. long, filiform at the base, the upper half infundibuliform, 5—6 mm. diam. at the throat; *lobes* equal, white with the lower third claret-coloured, orbicular or suborbicular, 1·5—1·7 cm. long, up to 1·4 cm. wide, with a very short broad claw. *Stamens* arising in the perianth tube, the filaments decurrent, 3—4 mm. long, not exserted; anthers 3—4 mm. long, the upper half or three-quarters exserted. *Ovary* ovoid, 3 mm. long; style reaching to top of filaments, the branches subspathulate, conduplicate, about 2 mm. long.

HOLOTYPE. *Leipoldt* in the Bolus Herbarium (No. 21808).

Karroid broken veld vegetation.

Flowering period. September.

SWELLENDAM. Vlakte near Barrydale, 2,300 ft., *Levyns* 545 (CT).

PRINCE ALBERT. Eikerkraal, between Prince Albert and Klaarstroom, *Leipoldt* (BOL 21808, SAM).

Although a bright, contrasting patch of colour at the base of the perianth lobes is common in the section *Ixia*, it is rare in the section *Morphixia*, to which this species, with its distinctly funnel-shaped perianth tube, belongs. The lobes are white with a conspicuous claret-coloured patch at the base and short veins of the same colour extending up into the base of the white part. Another character which distinguishes this species is the width of the almost orbicular lobes; in most other species in the section they are more or less oblong.

7. **I. pauciflora** Lewis sp. nov.

Cormus ovoideus vel subglobosus, 1—1·8 cm. diam., tunicis e fibris fuscis subrobustis reticulatis plerumque in collo 1—2·5 cm. longo productis, compositis. *Caulis* filiformis, 22—38 cm. altus, simplex vel ramulis 1—2 brevissimis minus 1 cm. longis. *Vaginae basales* 2, membranaceae, brunneae, ad 12 cm. longae. *Folia* 3, 2 inferiora linearia vel lineari-filiformia, circa ad medium caulis attingentia, 0·5—1 mm. lata, firma nervo medio et marginibus sat prominentibus, supremum longius omnino vaginans. *Spica* terminalis laxe 1—2-flora (raro 3), laterales 1-flora. *Bractea* oblonga, breviter tricuspidata, 0·9—1·4 cm. longa, pellucida, sine colore vel pallide brunnea vel rosea, nervis fuscis 3; *bracteolae* quam bractea aequilongae, bicarinatae, breviter bicuspidatae. *Flores* sat grandes, gilvi vel pallide rosei vel lilacini vel violaceo-caerulei, plerumque odorati; *peranthii tubus* e bractea bene exsertus, circa 1·5 cm. longus, parte dimidia inferiore cylindrica, superne gradatim ampliatus in faucibus 4—6 mm. diam.; *segmenta* oblonga obtusa, 1·5—1·8 cm. longa, 7—9 mm. lata. *Stamina* in perianthii tubo medium versus orta, filamentis decurrentibus, ad 1·3 cm. longis persaepe leviter vel bene exsertis, raro plus minusve inclusis; antherae lineares, 5—6 mm. longae. *Ovarium* rotundum, 2·5—3 mm. longum; stylus prope ad apicem filamentorum vel ad medium antherarum attingens, ramis linearibus conduplicatis 4—5 mm. longis, parte dimidia vel tertia superiore leviter ampliata et minute ciliata.

Corm oviod or subglobose, 1—1·8 cm. diam.; tunics of dark fairly hard reticulate fibres usually extending up in a neck 1—2·5 cm. long. *Stem* filiform, 22—38 cm. high, simple or with 1—2 very short branchlets less than 1 cm. long. *Basal sheaths* 2, membranous, brownish, up to 12 cm. long. *Leaves* 3, the 2 lower linear or linear-filiform, about half as long as the stem, 0·5—1 mm. wide, firm with the mid-rib and margins slightly prominent; upper leaf much longer, entirely sheathing. *Spike* laxly 1—2-flowered (occasionally 3), the branchlets when present 1-flowered. *Bract* oblong, shortly tricuspidate, 0·9—1·4 cm. long, pellucid, colourless, pale brown or pinkish, with 3 dark veins; *bracteoles* as long as bract, bicarinate, shortly bicuspidate. *Flowers* fairly large, cream-coloured, pale pink, pale mauve or violet blue, usually fragrant; *perianth tube* about 1·5 cm. long, well exserted from bract, the lower half cylindrical and upper gradually expanded to 4—6 mm. diam. at the throat; *lobes* oblong, obtuse, 1·5—1·8 cm. long, 7—9 mm. wide. *Stamens* arising near middle of perianth tube, the filaments decurrent, up to 1·3 cm. long, slightly to well exserted or occasionally more or less included; anthers linear, 5—6 mm. long. *Ovary* rotund, 2·5—3 mm. long; style reaching nearly to top of filaments or to middle of anthers, the branches linear, conduplicate, 4—5 mm. long, usually with the upper third or half slightly expanded and minutely ciliate.

HOLOTYPE. *Barker* 8635 in the Compton Herbarium, Kirstenbosch.

Sandy flats and mountain slopes from the Clanwilliam Division to the Cold Bokkeveld in the Ceres Division.

Flowering period. August—September.

CLANWILLIAM. Cedarberg, *Lamb*, NBG 1621/30 (BOL); *Barnes* (BOL 19322); *Esterhuysen* 8074 (BOL); *Lewis* (BOL 22250); *Hafstrom* and *Acocks* 307 (S); *Stokoe* (SAM 55669); S. Cedarberg, *Esterhuysen* 20570 (BOL); Welbedacht Kloof, *Stokoe* (SAM 55667); Kromrivier, *Stokoe* (SAM 60110); Matjesrivier, *Wagener* 140 (NBG).

PIKETBERG. *Marloth* 10563 (PRE).

CERES. Elands Kloof, *Stokoe* (SAM 55665); *Lewis* 1398 (SAM); *Barker* 3781, 8428, 8600 (NBG); *Compton* 17347 (NBG); between Citrusdal and Cold Bokkeveld, *Leighton* 1261 (BOL, PRE); Cold Bokkeveld, near Elands Kloof, *Leighton* 1276 (BOL); same, Waboomsrivier, *Lewis* 1399, 4438, 5009 (SAM); north of Waboomsrivier, *Barker* 8635 (NBG); between Waboomsrivier and Ysterfontein, *Lewis* 2641 (SAM); Cold Bokkeveld, about 24 miles from Prince Alfreds Hamlet, *Story* 3004 (PRE).

A very slender narrow-leafed species closely allied to *I. capillaris* but with considerably larger flowers. It is somewhat intermediate between *I. capillaris* and *I. latifolia*, with the slender stem and narrow leaves of the former and a few uniformly large flowers resembling those of *I. latifolia.* The stamens are almost always long and well exserted from the perianth tube but they are occasionally short and more or less included.

In the Kew Index, Supplement 9, *I. paucifolia* Lewis was recorded as *I. pauciflora* in error. As far as is known the epithet *pauciflora* has not previously been used in the genus.

8. **I. cochlearis** Lewis, Fl. Pl. Afr. t. 969. 1946.

Corm obliquely ovoid or subglobose, 1·2—2·2 cm. diam.; tunics of very fine more or less reticulate fibres nearly always extending up in a neck 2—4 cm. long. *Stem* arising obliquely from the corm, simple, 15—45 cm. long (average 20—30 cm.), usually flexuose, sometimes curved near the middle and the upper half subdeclinate. *Leaves* 3 basal and 2 or 3 cauline, linear, erect or suberect, 10—30 cm. long, 1—3 mm. wide, usually reaching to base of spike or shortly below it. *Spike* 3—8 cm. long, somewhat laxly 4—12-flowered, the rachis usually flexuose. *Bract* obovate or oblong, 4—5 mm. long (rarely up to 6 mm.), tridentate, pale brown, pinkish or pallid with a few brown streaks, usually with 3 major and a few minor inconspicuous veins; *bracteoles* slightly shorter, bicarinate, bidentate. *Flowers* rose-pink or salmon-pink with darker median veins on the lobes; *perianth tube* 1—1·8 cm. long, the lower half slender and upper narrowly infundibuliform, gradually dilated to about 3 mm. diam. at the throat; *lobes* equal, oblong, obtuse, concave with the apex slightly involute, 1—1·7 cm. long, 6—8 mm. wide. *Stamens* arising near top of perianth tube, the filaments shortly decurrent, well exserted, 0·7—1 cm. long; anthers 4—5 mm. long. *Ovary* rotund, 2·5—4 mm. long; style reaching to top of anthers, the branches 1·5—2 mm. long, spathulate, conduplicate, minutely ciliate.

HOLOTYPE. *Wicht* in the National Herbarium, Pretoria (No. 27196).

Dry stony mountain slopes in the Stellenbosch Division.

Flowering period. November.

STELLENBOSCH. Jonkershoek, *Wicht* (PRE 27196, BOL, SAM); *Borchardt*, Jonkershoek Forest Reserve Station 584, 586 (BOL); *Parker* (K); *Levyns* (CT 7505); *Rehm* (M): Banhoek, *Martley* (SAM 53175, BOL)

A distinct species somewhat intermediate between the sections *Ixia* and *Morphixia* but placed in the latter on account of its narrowly funnel-shaped perianth tube, with the filaments arising shortly below the top and shortly decurrent (in the illustration of the type in Flowering Plants of Africa this is not very clearly shown). It is not very closely allied to any species in the section. The flowers resemble those of some forms of *I. latifolia* but the corm, leaves, simple flexuose stem and much shorter bracts are quite different.

9. **I. framesii** L. Bolus, S. Afr. Gard. 21: 368. 1931. *I. pulcherrima* Eckl. Top. Verz. 24. 1827, *nom. nud.*, pro parte.

Corm globose, 1·2—1·8 cm. diam.; tunics of fine soft reticulate fibres, often submembranous. *Stem* simple, very slender, 15—38 cm. high. *Basal sheaths* 2—3, 1—7·5 cm. long. *Leaves* 3 or 4, linear, erect, usually reaching to base of spike or shortly above it, 12—40 cm. long, 1—2 mm. wide, not conspicuously veined, the cauline leaf sometimes only shortly sheathing with a long free blade. *Spike* short, closely 2—12-flowered, usually 3—6. *Bract* obovate or oblong, 6—8 mm. long, acute or shortly tridentate, pallid below with the upper half soft, brown and more or less papyraceous, the apex soon becoming lacerated; *bracteoles* slightly shorter, closely bicarinate, bicuspidate or bidentate. *Flowers* flaccid, salmon-pink or pinkish terra-cotta with a darker circle at the centre and the tube purplish outside, or reddish yellow to yellow above with a very small dark ring at the centre and the outer lobes usually red outside; *perianth tube* 1·5—2 cm. long, filiform near the base, gradually expanded upwards and narrowly infundibuliform, 3—5 mm. diam. at the throat; *lobes* oblong, ovate or obovate-oblong, obtuse, equal or the inner slightly larger than the outer, 1·5—2·4 cm. long, 0·8—1·2 cm. wide. *Stamens* arising within the tube, the filaments shortly decurrent, 4—5 mm. long, included or extending 1—2 mm. above the throat; anthers yellow, 4—6 mm. long, partly or entirely exserted. *Ovary* globose, about 3 mm. long; style reaching to base or middle of anthers, the branches 2—3 mm. long, linear, conduplicate, with the upper half minutely ciliate.

HOLOTYPE. *Frames* in the Bolus Herbarium (No. 19896).

Sandy flats in the Malmesbury Division.

Flowering period. September—October.

MALMESBURY. Near Darling, *Frames* (BOL 19896, K); between Darling and Malmesbury, *Salter* 2711 (K, SAM); Darling, *Strey* 271 (M); Darling Flower Show, *Maguire* 445 (NBG); Groenekloof, *Ecklon* 81 (66·9) (G, SAM—named *I. pulcherrima*); near Klipfontein, Swartland, *Pappe* (SAM 25226); near Green River, 26—27 miles N. of Cape Town on national road, *Lewis* 5749 (NBG); Kalabas Kraal, *Werdermann* and *Oberdieck* 293 (B, PRE).

WITHOUT LOCALITY. *Ecklon* (L); *Thunberg* (UPS, *I. maculata* sheet b).

The delicate nature of the flowers renders this distinct and very beautiful species unsuitable for cultivation. The flowers tend to close as soon as they are picked and do not fully open in water.

Some of the plants distributed by Ecklon as *I. pulcherrima* are this species and others *I. campanulata*, but Ecklon's name must in any case be rejected as a *nomen nudum* since he gave no description of the plant, only a note on the colour of the flowers "Blumenblatter hochroth glanzend", which applies to *I. campanulata* rather than *I. framesii.*

Dr. L. Bolus placed *I. framesii* in the section *Ixia* on account of the dark circle of colour at the centre of the flower but it has been found that no great importance can be attached to this character as flowers with or without a contrasting patch of colour in the middle may occur in the same species (e.g. *I. polystachya*), also that flowers with contrasting colours on the lobes do occur in the section *Morphixia*, as in *I. leipoldtii.* It is on account of its funnel-shaped tube, in which the stamens are more or less included, that *I. framesii* is now placed in the section *Morphixia.*

10. **I. odorata** Ker (Fig. 2), Gen. Irid. 101. 1827; Baker, Handbk. Irid. 165. 1892 et Fl. Cap. 6: 84. 1896; Dur. & Schinz, Consp. Fl. Afr. 5: 185. 1895; Pole Evans, Fl. Pl. S. Afr. 9. t. 349. 1929. *Morphixia odorata* (Ker) Baker, Journ. Linn. Soc. Bot. 16: 97. 1877. *Ixia erecta* var. Jacq. Hort. Schoenbr. t. 18. fig. min. 1797. *I. erecta* var. *lutea; odorata* Ker, Bot. Mag. t. 1173. 1809. *I. polystachya* var. *flexuosa* Lam. Encyc. 3: 339. 1789. *I. flavescens* Eckl. Top. Verz. 26. 1827. *I. polystachya* var. *flavescens* (Eckl.) Baker, Journ. Linn. Soc. 16: 90 et Fl. Cap. 6: 78; Dur. & Schinz l. c. 185. ? *I. erecta* sensu Thunb. Diss. Ix. 16. 1783. ? *I. avellana* Foster, Contrib. Gray Herb. 114: 47. 1936.

Corm ovoid or globose, 0·9—1·4 cm. diam.; tunics of fine or moderately fine reticulate fibres. *Stem* 20—55 cm. high, usually 35—45 cm., simple or with 1 or occasionally 2 short suberect branches. *Leaves* 3—6, linear or lanceolate, suberect to erect or the outer sometimes patent, often spirally twisted above the middle, 8—30 cm. long, usually reaching to about middle of stem and 12—18 cm. long, 1·5 mm. to 1 cm. wide, the margins and mid-rib sometimes slightly prominent. *Spike* short, compact, 2·5—6·5 cm. long, closely 5—18-flowered. *Bract* 5—7 mm. long, shortly cuspidate or with a cusp and 2 short teeth or tricuspidate, somewhat colourless or slightly pinkish with 1, 3 or several inconspicuous veins; *bracteoles* bicuspidate or sometimes bifid nearly to the middle. *Flowers* small, sulphur or lemon-yellow, the outer lobes occasionally flushed with red outside; *perianth tube* 0·7—1·1 cm. long, the lower half filiform and upper narrowly infundibuliform, usually 2—3 mm. diam. at the throat; *lobes* oblong, about as long as the tube, rarely up to 5 mm. longer, 4·5—5·5 mm. wide, equal or the outer a little wider than inner, concave with the apex usually more or less involute. *Stamens* arising near the throat, the filaments shortly decurrent, 4—5 mm. long, exserted from the tube;

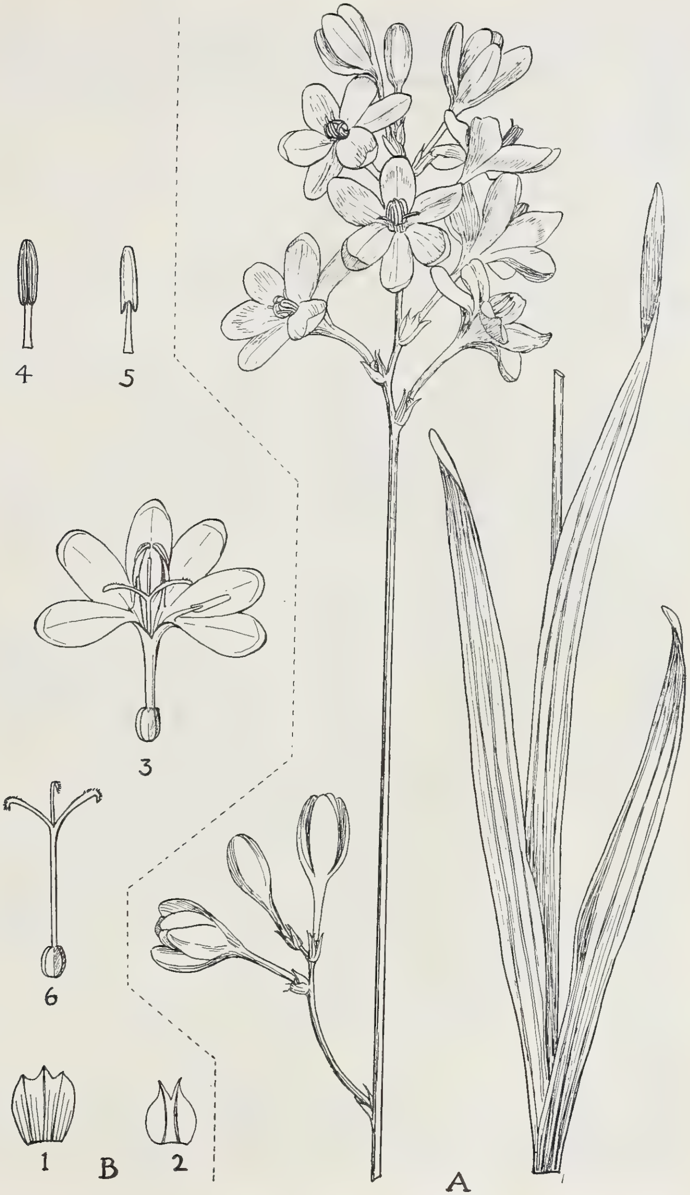


FIG. 2.—*I. odorata.* A. Copied from Bot. Mag. t. 1173 (*I. erecta* var. *lutea*; *odorata* Ker). B. *Lewis* No. 5541. 1. Bract × 2. 2. Bracteoles × 2. 3. Flower laid open × 1½. 4. Stamen, front view, × 2. 5. Stamen, back view, × 2. 6. Gynaecium × 1½. Del. G. J. Lewis.

anthers linear, 4—5 mm. long. *Ovary* oblong or ovoid, about 3 mm. long; style reaching to top of perianth tube or up to 1 mm. above, the branches 4·5—7 mm. long, linear, conduplicate, appearing filiform, sometimes very slightly expanded towards the apex, usually about half as long as the style.

LECTOTYPE. Botanical Magazine t. 1173.

Fairly common on sandy flats and lower slopes of mountains in the south-western districts of the Cape Province.

Flowering period. September—November.

CLANWILLIAM. Olifants River and Villa Brakfontein, *Ecklon* and *Zeyher* 76·10 (PRE).

PIKETBERG. *Guthrie* (BOL); Kapiteins Kloof, Piketberg Mt., *Pillans* 7801 (BOL, K); Porterville, *Loubser* 412 (BOL); mountain above Porterville, *Loubser* 857 (NBG); Cardouw Pass, *Compton* 23019 (BOL, NBG); Twenty-four Rivers, *Leipoldt* 3816 (NBG).

TULBAGH. Tulbaghskloof, *Ecklon* 87 (77·9) (*I. flavescens* Eckl.; B, BR, G, PRE, SAM, S, UPS, Z); *Ecklon* 435 (PRE, Z).

WORCESTER. *Zeyher* (K); between Worcester and Villiersdorp, *Lewis* 2902 (SAM); between Slangheuvel, French Hoek and Donkerhoek, *Drege* 8353 (G).

HOPEFIELD. Near Hopefield, *Bachmann* 1219 (Z).

MALMESBURY. Between Mamre and Darling, *Lewis* 1028 (SAM); road to Malmesbury, *Dame Alice* and *Misses Godman* 442 (BM); Darling, *Letty* 127 (K, PRE); Mamre, *Lewis* 5541 (NBG); *van Niekerk* 269 (NBG); *Compton* 15859 (NBG); Groenekloof, *Pappe* (SAM 25231); Kalabas Kraal, *Strey* 277 (M); near Riebeeck Kasteel, *Leipoldt* 3818 (BOL).

BELLVILLE. Durbanville, *Compton* 16019 (NBG).

CAPE. Near Hout Bay, *Salter* 8686 (BOL); *Lewis* 947 (SAM); near Camps Bay, *Pappe* (K); Table Mt., *Rehmann* 605 (BM, BR, Z); Devils Peak, *Dod* 383 (BM, BOL, K); *Bolus* 4005 (BOL); between Wynberg and Kirstenbosch, *Zeyher* 4668 (BM, BOL, K, SAM); Constantia Nek, *Salter* 332/15 (BM); *Barker* 3188 (NBG); *Pillans* 10506 (BR); Orange Kloof, *Dod* 3480 (BM, BOL, K); Wynberg plateau, *Esterhyusen* (BOL 26894).

PAARL. French Hoek, 1,500 ft., *Phillips* 1312 (SAM); French Hoek Pass, 2,000 ft., *Barker* 4901 (NBG).

STELLENBOSCH. Hottentots Holland Mts., 3,000 ft., *Esterhuysen* 9957 (BOL).

CALEDON. Near Mossel River, *Purcell* (SAM 46272); *Martin* 563 (NBG); near Hermanus, *Barker* 1792 (NBG); *Rogers* 26505 (PRE, Z); *van Niekerk* 660 (BOL); *Marloth* 7117 (PRE); *Gillett* 4367 (BOL); Rooi Els, *Leipoldt* 4157 (BOL); Hottentots Holland Mts., *Stokoe* 8093 (BOL).

WITHOUT LOCALITY. *Drege* (G); *Sieber* 130 (G, K, L, M); *Harvey* 872 (BM); *Jussieu* 3594, partly (P); *Ecklon* 437 (K, M, PRE); *Lamarck* (P; *I. polystachya* var.); *Oldenland* (M); *Sparrman* (S); *Thunberg* (S, UPS).

As far as is known the flowers always remain closed in the morning and open in the early afternoon. In the dried state it is sometimes difficult to distinguish this species from the yellow variety of *I. polystachya*, or small-flowered forms of *I. dubia*, especially when the perianth tube is very slightly expanded and only narrowly funnel-shape, but living plants can readily be distinguished by the way in which the lobes spread, not from the top of the tube as in the section *Ixia*, but from shortly above the base of the lobes with the lower part more or less erect and overlapping to form a wide funnel-like extension of the tube. This is clearly shown in the excellent illustration in the Botanical Magazine, t. 1173.

In his account of the South African Iridaceae of Thunberg's Herbarium, N. E. Brown made the following statement about the sheets named *I. erecta*:— "Three sheets, all *I. erecta* Thunb. but not *I. erecta* Berg. Cap. 5 (1767) which is a synonym of *I. polystachya* L. Thunberg's plant is the same as *Sieber* 130 and *Ecklon* 442 (issued as *I. monadelpha*). It has broad leaves (3—7 lines broad), with the flowers very closely placed on the spike, and is quite distinct from *I. erecta* Berg., which has narrower leaves and the flowers lax and rather distant on the spike." (Trans. Linn. Soc. Bot. 48: 46. 1928). It is twelve years since I examined Thunberg's specimens and as I did not make detailed notes on those named *I. erecta* at the time my recollection of them is somewhat uncertain. However, I have recently examined *Sieber* 130 and *Ecklon* 442 in Kew Herbarium (kindly sent here on loan), and found that the former, which N. E. Brown considered to be an exact match with Thunberg's plants, is *I. odorata*. I have accordingly cited *I. erecta* sensu Thunb. in the synonymy, though with a query as there remains some doubt about it.

The second collection which Dr. Brown considered to be the same as *I. erecta* Thunb., *Ecklon* 442, does not match *Sieber* 130 but is the blue or mauve-flowered variety of *I. polystachya* I have named var. *crassifolia*. A third species is also involved as Dr. Brown noted on a sheet in Kew Herbarium containing two specimens of *I. dubia*, collected by Dr. Thom, that he had compared this with Thunberg's sheets of *I. erecta* and found that they matched except that the leaves are broader in Thunberg's plants. Thunberg described the flowers as "Variat corollis luteis et violaceis unicoloribus", and in view of this and the above identifications by N. E. Brown, the identity of Thunberg's *I. erecta* remains uncertain and cannot be decided without making a critical examination of his plants. There seems to be a possibility that more than one species was named *I. erecta* by him.

In 1936 Foster drew attention to Dr. Brown's report on Thunberg's sheets named *I. erecta* and since Thunberg's plants appeared to him to be without a name (*I. erecta* Thunb. being a later homonym of *I. erecta* Berg.=*I. polystachya* L.) he named the species *I. avellana*. This name is also cited above with a query as a synonym of *I. odorata*.

Var. **hesperanthoides** Lewis var. nov.

Var. *odoratae* similis sed floribus minoribus, albis vel gilvis interdum segmentis exterioribus extrinsecus rubidis.

Perianthii tubus 5—8 mm. longus, segmentis aequans. *Filamenta* 2—3 mm. longa; antherae 4—5 mm. longae.

Like var. *odorata* but the flowers slightly smaller, white or cream-coloured with the outer lobes sometimes reddish outside.

Perianth tube 5—8 mm. long, as long as the lobes. *Filaments* 2—3 mm. long; anthers 4—5 mm. long.

HOLOTYPE. *Pillans* 7184 in the Bolus Herbarium.

Mountain slopes in the Piketberg, Tulbagh and Worcester Divisions.

Flowering period. October—December.

PIKETBERG. Top of range S. of Zebrakop, *Pillans* 7184 (BOL, PRE, SAM); Piketberg Mt., *Barker* 7561 (NBG).

TULBAGH. Near Tulbagh, *Ecklon* 438 (K, M, PRE).

WORCESTER. Du Toits Kloof, *Drege* 8370 (K, S); Hex River Valley, *Tyson* 715 (BOL, SAM).

WITHOUT LOCALITY. *Ecklon* and *Zeyher* 237 (1. 12) (G); *Thunberg* (UPS).

This variety closely resembles *I. orientalis* but has short filaments and a short style with comparatively long branches arising at the throat of the tube; the flowers, too, are usually smaller. The funnel-shaped tube distinguishes it from *I. polystachya* with which it has sometimes been confused. The small sweet-scented flowers with fairly long slender style branches arising at the throat of the tube are similar to those of some species of *Hesperantha*, and according to a note by Mr. Pillans the flowers open late in the afternoon as in that genus.

It is possible that the name *I. alba* Eckl. (Top. Verz. 27. 1827), a *nomen nudum* and also a later homonym of *I. alba* L. (=*Sparaxis* sp.), was meant for this plant but as Ecklon and Zeyher applied it to two different species there is some doubt about it. In the Delessert Herbarium in Geneva plants of *I. odorata* var. *hesperanthoides*, *Ecklon* and *Zeyher* 267, are named *I. alba*, while in other herbaria there are some collections of *I. orientalis* issued as *I. alba* (e.g. *Zeyher* 4007).

11. **I. stohriae** L. Bolus, S. Afr. Gard. 21: 281—2. 1931. *Tritonixia conferta* Klatt, Abh. Naturf. Ges. Halle 12: 356 et Erganz. 22. 1882; Dur. & Schinz, Consp. Fl. Afr. 5: 209. 1895.

Corm ovoid, 0·5—1 cm. diam.; tunics of very fine soft reticulate fibres. *Stem* 15—35 cm. high (occasionally up to 50 cm.), slender, simple or with 1—2 more or less patent curved branches. *Basal sheaths* 2, 2—10 cm. long. *Leaves* 4—6, 2—3 basal and 2—3 cauline, erect, flaccid, linear or linear-lanceolate, 10—45 cm. long, 2—4 mm. wide. *Spike* 1·5—5·5 cm. long, fairly closely 3—12-flowered. *Bract* ovate, tricuspidate or tridentate, 5—6 mm. long, usually mauve-pink with 3 or 5 dark veins; *bracteoles* bicarinate, bicuspidate or bidentate. *Flowers* pale pink or white flushed with pink outside; *perianth tube* 1—1·6 cm. long, slightly and gradually expanded from base to throat or the lower half cylindrical and upper narrowly infundibuliform, occasionally more or less tubular, 2·5—3 mm. diam. at the throat; *lobes* slightly shorter than tube, oblong, 0·9—1·4 cm. long, 3·5—6 mm. wide, the outer very slightly larger than inner. *Stamens* arising a little below the throat, the filaments shortly decurrent, 2—3 mm. long, included or with the tips exserted; anthers oblong or linear-oblong, 2—3 mm. long. *Style* reaching nearly to top of filaments or middle of anthers, the branches subspathulate, conduplicate, recurved, 1·5—2·5 mm. long.

LECTOTYPE. *Smith* in the Bolus Herbarium (No. 19879).

Mountain slopes and kloofs in the Swellendam Division.

Flowering period. September—October.

SWELLENDAM. *Stohr*, NBG 1174/24 (BOL); Voormansbosch, *Zeyher* 4014 (SAM, K, PRE, Z); 10 o'clock Mt., 800 ft., *Wurts* 357 (NBG); Tradouw Pass, *Smith* (BOL 19879); *Esterhuysen* 24614 (BOL); *Sidey* 1793 (PRE); same, 2,000 ft., *Wurts* 1676 (NBG).

I. stohriae is distinguished from the closely allied *I. fucata* by its perianth tube which is nearly always slightly expanded to the throat and more or less narrowly funnel-shaped, its shorter filaments included in the tube or with the tips exserted, and shorter anthers, only 2—3 mm. long as against 4—5 mm. in *I. fucata.*

Two collections were cited under the original description, the first, collected by Mrs. Stohr in whose honour the species was named, is a single incomplete plant, but there are five complete plants in the second, collected by Smith, and since the description must have been largely based on them, the second has been selected as the lectotype. These collections have been compared with isotypes of *Tritonixia conferta* Klatt, *Zeyher* 4014, and found to be the same, but as Foster gave the name *Ixia conferta* to a different species in 1936, the specific epithet cannot now be used for this one.

In the Flora Capensis Baker placed *Tritonixia conferta* Klatt as a synonym of *Tritonia dubia* Eckl. (vol. 6, p. 125), and cited *Zeyher* 4014, but earlier in the same work (p. 79) he cited *Zeyher* 4014 under *I. aristata* var. *elegans*. According to N. E. Brown, *Zeyher* 4014 is *I. polystachya*, "the true plant, and distinct from several of the specimens so named by Baker" (Journ. Linn. Soc. Bot. 48: 43, 1928). I have dissected a flower from a plant of *Zeyher* 4014 in the South African Museum Herbarium (which matches material in Kew Herbarium) and found it to be the same as *I. stohriae*, with short filaments included in the narrow funnel-shaped tube. In the Zurich University Herbarium, however, there are two species under *Zeyher's* No. 4014, one being *I. stohriae* and the other *I. orientalis* which somewhat resembles the former but has a comparatively shorter perianth tube and much longer stamens well exserted from the tube. As it is very unlikely that Klatt would have placed specimens of *I. orientalis* in his genus *Tritonixia*, it is fairly safe to assume that his type of *T. conferta* (which was destroyed during the last war) must have been the same as the isotypes in Kew and the South African Museum Herbarium.

12. **I. fucata** Ker, Bot. Mag. t. 1379. 1811; Dur. & Schinz, Consp. Fl. Afr. 5: 183. 1895.

Corm ovoid or subglobose, 1·5—2 cm. diam.; tunics of fine reticulate fibres usually extending up in a neck 3—6 cm. long. *Stem* 15—60 cm. high, usually 15—30 cm., slender, simple or with 1 very short suberect branch. *Leaves* 3—4, linear or subulate, usually 2 basal and 2 cauline, 13—48 cm. long, 1·5—3 mm. wide, the mid-rib and often the margins fairly prominent, sometimes faintly striate with 4 or 5 slightly raised veins. *Spike* very short, 2—7-flowered, the rachis usually flexuose, sometimes curved and more or less declinate. *Bract* ovate or ovate-oblong, tridentate, 5—8 mm. long, pellucid, pinkish mauve, conspicuously 3 or 5-veined, sometimes minutely speckled with brown near the apex; *bracteoles* slightly longer than bract, bicarinate, bicuspidate. *Flowers* hypocrateriform, white or pale pink, the perianth tube and outer lobes suffused with deep pink or maroon outside and usually small streaks of the same colour at the base of all the lobes inside; *perianth tube* 1—1·5 cm. long, tubular throughout and about 2 mm. in diam. or sometimes slightly expanded from the base to the middle and tubular above, 1·5—2 mm. diam. at the throat; *lobes* as long as the tube or slightly shorter, oblong or obovate, obtuse, 0·9—1·4 cm. long, 5—8 mm. wide, equal or the outer slightly wider than inner. *Stamens* arising shortly below the throat, the filaments decurrent on the tube, exserted, 3—5 mm. long; anthers 4—5 mm. long, linear, subsagittate. *Style* reaching to middle or top of anthers, the branches 2—3 mm. long, oblanceolate, conduplicate, recurved.

LECTOTYPE. Botanical Magazine t. 1379.

Mountain slopes and kloofs in the Ceres, Worcester, Montagu and Robertson Divisions at altitudes of 3,000 to 6,000 ft.

Flowering period. September—November.

CERES. Ceres Wild Flower Show, *Barker* (BOL).

WORCESTER. Keeromsberg, 4,500 ft., *Esterhuysen* 9248 (BOL); Hex River Mts., Milner Ridge Peak, 5,000—6,000 ft., *Esterhuysen* 9326 (BOL); Hex River Mts., Mt. Brodie, 5,000—5,500 ft., *Esterhuysen* 22229 a (BOL).

ROBERTSON. Near stream in kloof, *Levyns* (CT 4374).

MONTAGU. Donker Kloof, 3,000 ft., *Compton* 18477 (NBG, SAM).

Var. **filifolia** Lewis var. nov.

A var. *fucata* caule longiore graciliore et foliis longioribus angustissimis differt.

Cormus ovoideus, 1—1·5 cm. diam., tunicis non in collo productis. *Caulis* filiformis, 30—60 cm. longus. *Vaginae basales* 2, 3—9 cm. longae. *Folia* 3, lineari-filiformia, 30—60 cm. longa, 0·5—1 mm. lata. *Spica, bractea* et *flores* var. *fucatae* similes.

Differs from var. *fucata* in having a longer and more slender stem and longer very narrow leaves.

Corm ovoid, 1—1·5 cm. diam.; tunics not produced up in a neck. *Stem* filiform, 30—60 cm. high. *Basal sheaths* 2, 3—9 cm. long. *Leaves* 3, linear-filiform, 30—60 cm. long, 0·5—1 mm. wide. *Spike, bract* and *flowers* as in var. *fucata*.

HOLOTYPE. *Stokoe* in South African Museum Herbarium, National Botanic Gardens, Kirstenbosch.

Mountain slopes up to 3,500 ft., alt. in the Paarl, Worcester and Caledon Divisions.

Flowering period. September—October.

WORCESTER. Boschjesveld Mts., Worcester side, *Stokoe* (SAM 68608, 68609).

PAARL. French Hoek Forest Reserve, *Lewis* (BOL 26938).

CALEDON. Wolven Kop, Wildepaardeberg, 3,500 ft., *Stokoe* 2507 (BOL).

This species is distinguished by its tubular perianth tube, about 2 mm. in diameter, which does not expand to the throat. During the past thirty years it has been collected in the various localities cited above but for over a hundred years it was known only from the Botanical Magazine figure, published in 1811, from a drawing made several years earlier. Ker expressed some doubt about it being a genuine species and suggested that it might be a garden hybrid, possibly a cross between *I. crateroides* (=*I. campanulata*) and *I. capillaris*. The same view was held by

Baker, who mentioned *I. fucata* in a note under *I. scariosa* (=*I. latifolia*) in the Flora Capensis (Vol. 6, p. 83), and suggested that the latter might be one of the parents. In the Genera Plantarum, Bentham and Hooker suggested that *I. fucata* would be better placed in the genus *Hesperantha* (Vol. 3, p. 704). However, since ample material which matches the type figure is now available, there is no longer any doubt that it is a genuine and very distinct species of *Ixia*. It seems to belong in the section *Morphixia* rather than the other two, and is closely allied to *I. stohriae*, in which the perianth tube is usually slightly expanded to the throat, with the stamens not or only shortly exserted.

In the form from the Montagu and Robertson Divisions the stamens are all directed to one side and unilateral.

13. **I. orientalis** L. Bolus, S. Afr. Gard. 19: 27. 1929. *I. scariosa* var. *longifolia* Baker, Handbk. Irid. 165. 1892 et Fl. Cap. 6: 83. 1896, pro parte.

Corm ovoid or subglobose, 0·6—1·4 cm. diam.; tunics of fine reticulate fibres. *Stem* slender, often filiform, 25—75 cm. high, simple or with 1—3 erect filiform branches. *Basal sheaths* 2 or 3, acuminate, 2—12 cm. long. *Leaves* 4—5, linear or linear-lanceolate, 7—60 cm. long, 1·5—6 mm. wide, occasionally to 8 mm., suberect or erect, usually slightly twisted, the mid-rib fairly prominent. *Spike* laxly or fairly laxly 2—16-flowered, the rachis usually somewhat flexuose with the bracteoles closely adpressed to the curves. *Bract* oblong or ovate, 5—8 mm. long, subtruncate with a very short cusp, sometimes with a cusp and 2 short teeth or shortly tridentate, pellucid, colourless or pinkish to pinkish mauve, rather faintly 3 or several-veined; *bracteoles* bicarinate, bicuspidate. *Flowers* cream-coloured, very pale pink or mauve-pink, the outer lobes usually mauve outside; *perianth tube* 0·7—1 cm. long, occasionally to 1·2 cm., the lower half cylindrical and upper narrowly infundibuliform, 2—3 mm. diam. at the throat; *lobes* oblong, obtuse, 1—1·8 cm. long, 5—9 mm. wide, equal or the outer slightly shorter and wider than inner. *Stamens* arising near top of perianth tube with the filaments shortly decurrent, 3·5—6 mm. long, well exserted; anthers 4—5 mm. long, linear-oblong, up to 2 mm. wide. *Ovary* oblong or rotund, about 3 mm. long; style reaching above middle of filaments, sometimes nearly to top of anthers, the branches linear, conduplicate, 3—5 mm. long, slightly expanded and minutely ciliate towards the apex.

HOLOTYPE. *Dyer* 1684 in the Bolus Herbarium. PRE iso

Sandy flats, hills and mountain slopes in the southern and south-eastern districts of the Cape Province.

Flowering period. September—October, occasionally also from November to January.

CALEDON. *Prior* (K); Villiersdorp, *Esterhuysen* (BOL 26874); River Sonderend, *Martin* 788 (NBG); *Stokoe* (SAM 63501): Genadendal, *Prior* 148, 163 (K).

BREDASDORP. Bontebok Park, *Martin* 583 (NBG); Die Mond, *Heginbotham* 167 (NBG).

SWELLENDAM. *Martin* 368 (NBG); *Zeyher* 452 (SAM), 4007 (K, PRE, SAM, S, Z); Hermitage Kloof, *Wurts* 381 (NBG); Marloth Reserve, *Wurts* 376 (NBG); Voormansbosch, *Zeyher* 4014, partly (Z).

RIVERSDALE. Soetmelks Rivier, *Burchell* 6708 (K); between Riversdale and Albertinia, *Barker* 84 (K); near Albertinia, *Lewis* 3642 (SAM); *Barker* 8169 (NBG); *Cassidy* 242, 245 (NBG); hills near Kafirkuils River, *Muir* 2983 (PRE); road to Gouritz River mouth, *Lewis* 5594 (NBG); Garcias Pass, north end, *Lewis* 5650 (NBG); near Riversdale, *Schlechter* 2024 (Z).

MOSSEL BAY. *Muir* (BOL 21935); Ruytersbosch, *van Niekerk* 85 (BOL, PRE).

LADISMITH. Rooiberg, *Wurts* 1648 (NBG).

GEORGE. Great Brak, *Burchell* 6156 (K); *Lewis* 5606 (NBG); 4 miles E. of Great Brak, *Lewis* 5579 (NBG); near George, *Burchell* 6092 (K); Montagu Pass, *Rehmann* 50 (BM, BR, Z); slopes above Victoria Bay, *Lewis* 3641 (SAM); *Barker* 8171 (NBG); Groen Vlei, *Martin* 369 (NBG); Ruigte Vlei, Swart Rivier, *Fourcade* 1530 (BOL, K, PRE).

OUDTSHOORN. Near top of Swartberg Pass, 5,000 ft., *Stokoe* (SAM 63502, 68327); Meirings Poort, *Stokoe* (SAM 60176).

KNYSNA. Portland, *Duthie* 521 (BOL); Belvidere, *Duthie* 1140 (BOL); between Knysna River Bridge and Ashford, *Duthie* 1143 (BOL); Noetzie, *Middlemost* (NBG, SAM); Keurbooms River, *Theron* 2098 (PRE); Plettenberg Bay, *Smart* (PRE); *Rogers* 26705, 27965 (Z); Groot Rivier, *Taylor* 3609 (NBG).

UNIONDALE. Near Avontuur, *Bolus* 2487 (BOL, K); *Gillett* 1587 (BOL); Kouga Mts., near Smutsberg, *Esterhuysen* 10773 (BOL); Hoopsberg, *Esterhuysen* 6575 (BOL).

HUMANSDORP. Ratelsbosch, Tsitsikamma, *Fourcade* 501 (BOL); Kruisfontein, near Humansdorp, *Galpin* 4685 (K, PRE); Humansdorp, *Thode* A 1039 (K, PRE); Jeffreys Bay, *Fourcade* 4008 (K).

UITENHAGE. Despatch, *Holland*, NBG 1383/25 (BOL); Addo, *Ecklon* and *Zeyher* 77 (SAM), 697 (S).

PORT ELIZABETH. *Long* 811 (K, PRE); Walmer, near Port Elizabeth, *Paterson* 772 (BOL); near Port Elizabeth, *Blackbeard* (BOL); Baakens Valley, Port Elizabeth, *Cruden* 394 (PRE); Green Bushes, about 10 miles N.W. of Port Elizabeth, *Holland* 3642 (BOL); Longmore Forest Reserve, *Long* 1050 (K, PRE).

ALBANY. Between Sevenfountains and Sidbury, *R.A. Dyer* 1684 (BOL, K, PRE); near Southwell, Lower Albany, *Schonland* 781 (Z).

BATHURST. Port Alfred, *Rogers* 4413 (BOL).

WITHOUT LOCALITY. *Cooper* 460 (K—locality given is Elands Bay).

This species is widely distributed through the southern and south-eastern districts of the Cape Province and extends as far as the Bathurst Division, the easternmost locality on record for the genus. In the dried state it closely resembles *I. flexuosa* in the section *Ixia*, but is distinguished by its slightly longer perianth tube, about as long as the lobes or slightly longer, with the upper half gradually expanded to the throat and narrowly funnel-shaped, the stamens arising near the top and shortly decurrent.

Baker's var. *longifolia* of *I. scariosa* (Handbk. Irid. 165 and Fl. Cap. 6: 83) was based on two collections which represent two distinct species, one of which is *I. orientalis* (*Bolus* 2487). The other, *Bolus* 2621, is a variety of *I. rapunculoides*.

SECTION **IXIA**

Section *Eurydice* Pers. Syn. 1: 48. 1805. Subgenus *Eurydice* (Pers.) Baker, Journ. Linn. Soc. Bot. 16: 92. 1877, Handbk. Irid. 161. 1892 et Fl. Cap. 6: 77. 1896.

Perianth tube short (up to 1·8 cm. long), cylindrical, slender, rarely slightly expanded to the throat; lobes longer than the tube, usually connate for 1—2 mm. above the throat and hypocrateriform; stamens arising in throat of perianth tube, well exserted, the filaments not decurrent, often connivent at the base and sometimes partly or entirely connate.

(Exceptions: Perianth lobes sometimes as long as tube in *I. monadelpha*. Perianth tube subinfundibuliform in *I. purpureorosea* and sometimes in *I. flexuosa*).

Type species: *I. polystachya L.*

14. **I. polystachya** L. Sp. Pl. ed. 2. 1: 51. 1762 (Mill. Ic. t. 155. f. 2. 1757, sine nom.); Burm. f. Fl. Cap. Prod. 1. 1768, pro parte; Ait. Hort. Kew. 1: 58. 1789; Andr. Bot. Rep. t. 155. 1801; Baker, Handbk. Irid. 161. 1892 et Fl. Cap. 6: 77. 1896; Dur. & Schinz, Consp. Fl. Afr. 185. 1895; Lewis, Fl. Pl. Afr. t. 968. 1945–6 et in Adamson & Salter Fl. Cap. Pen. 249. 1950. *I. erecta* Berg. Pl. Cap. 5. 1767; Ker, Bot. Mag. t. 623. 1803. *I. serotina* Salisb. Prod. 34. 1796. *I. leucantha* Jacq. Ic. t. 278. 1786—93 et Coll. Suppl. 11. 1796; Baker, Handbk. Irid. 162 et Fl. Cap. 6: 79, pro parte; Dur. & Schinz, l. c. 184. *I. patens* Ait. var. *leucantha* (Jacq.) Ker, Gen. Irid. 98. 1827. *I. maculata* sensu DC. in Red. Lil. t. 137. 1805.

I. maculata var. *caesia* Ker, Bot. Reg. t. 530. 1821. *I. viridiflora* var. *caesia* (Ker) Baker, Journ. Linn. Soc. Bot. 16: 92. 1877, Handbk. Irid. 164 et Fl. Cap. 6: 82; Dur. & Schinz, l. c. 187. *I. aristata* Ker var. *elegans* (Regel) Baker, Handbk. Irid. 162, non Fl. Cap. *I. elegans* (Regel) N. E. Br. Journ. Linn. Soc. Bot. 48: 43. 1928. *Wuerthia elegans* Regel, Bot. Zeit. 9: 596. 1851 et Gartenfl. 98. t. 46. f. 2. 1853. *Ixia palliderosea* Eckl. Top. Verz. 24. 1827, *nomen nud.*

Corm ovoid, globose or depressed-globose, 0·8—2·5 cm. diam.; tunics of pale or reddish brown fine reticulate fibres, sometimes papyraceous. *Stem* 30 cm. to 1 m. high, slender, simple or with 1—4 slender suberect to erect branches, in more robust plants the stem and branches stouter and the branches often patent. *Basal sheaths* 2, acute or acuminate, up to 12 cm. long, soon disintegrating. *Leaves* 5—8, distichous, erect or suberect, linear or lanceolate, usually reaching above middle of stem, sometimes nearly to the top, 2—8 mm. wide or sometimes up to 1·4 cm. in robust plants, soft and grass-like or moderately firm. *Spike* varying from lax and many-flowered to short, few-flowered and compact. *Bract* ovate or oblong, 3—7 mm. long (up to 9 mm. in robust plants), obtuse, subacute or shortly cuspidate, occasionally with 2 short teeth and a cusp, pellucid, whitish, sometimes minutely flecked with brown at the apex, occasionally subcarinate or faintly striate with pale slightly raised nerves; *bracteoles* bicarinate, bidentate or bicuspidate. *Flowers* faintly scented, variable in colour and size, white, pale mauve, pinkish mauve or pale to deep mauve or bluish, with or without a small stain of yellow, blue, green, mauve or purple in the middle, the outer lobes often tinted with blue or green outside; *perianth tube* exserted from bract, cylindrical, usually filiform, 0·5—1·4 cm. long; *lobes* usually about twice as long as tube, connate for 0·5—1 mm., patent, oblong or obovate-oblong, obtuse (rarely subacute), 1—2·5 cm. long, 5—9 mm. wide. *Stamens* arising at top of tube; filaments 3—4 mm. long, sometimes blue; anthers linear, usually diverging, 4—7 mm. long. *Ovary* rotund, 2—3 mm. long; style reaching to base or middle of filaments or to base of anthers, the branches blue, yellow or white, linear, conduplicate, 3—4 mm. long, falcate or recurved, the upper half minutely ciliate.

HOLOTYPE. Miller Ic. t. 155. f. 2.

Flats, hills and mountain slopes, generally in shade, marshy ground or near streams.

Flowering period. October—December.

CLANWILLIAM. Between Theerivier and Keerom, *Pillans* 8674 (BOL, SAM); Warm Baths, *L. Bolus* (BOL 20402, K); *van Zyl*, NBG 616/27 (BOL); Cedarberg, *Wettstein* 39, 42 (M).

CERES. Witels Kloof, off Michells Pass, *Esterhuysen* 14130 (BOL, NBG, PRE); Ceres, *Calderwood*, NBG 2596/29 (BOL).

TULBAGH. *Pappe* (SAM 20899); *Ecklon* and *Zeyher* 83 (SAM, S); *du Toit*, NBG 941/60 (NBG); Winterhoek, *Pappe* (SAM 48564); Witzenberg, *Zeyher* 4006 (PRE, SAM).

WORCESTER. *Zeyher* (K); *Cooper* 1629 (K), 1689 (BM, K); Bothashalt, *van Breda* 541 (PRE), 910 (NBG, PRE); Wolvekloof Forest Reserve, Bains Kloof, *Barker* 4264 (NBG); Worcester, near Waterfall, *Ecklon* and *Zeyher* 267 (S).

CAPE. Camps Bay, *Zeyher* (SAM 48569); Lions Head, *Marloth* 11978 (PRE); *Worsdell* (K); Table Mt., *Pappe* (BM, K, SAM); *Zeyher* (SAM); *MacGillivray* 476 (K); *Marloth* 597 (PRE); *Rehman* 606 (Z); near Kasteelspoort, *MacOwan* HNAA 264 (BM, BOL, K, SAM, UPS); Devils Peak, *Zeyher* (BOL 26877); *Dod* 400 (BOL, K); *Bolus* 3320 (BM, BOL, K); above Groot Schuur, *Dod* 386 (BM, K); near Rondebosch, *Burchell* 184 (K); *Bolus* 3320 (BOL); near Bishopscourt, *Rogers* (BM); Claremont, *Salter* 8901 (SAM); near Swartrivier, *MacOwan* 2555 (BOL, K); Kirstenbosch, *Lewis* 948 (SAM), 5753 (NBG); *Barker* (BOL 26875); *Acocks* 5388 (S); top of Skeleton Ravine, *Lewis* 679, 949 (SAM); *Leighton* 739 (BOL); *Esterhuysen* 12308 (BOL); between Skeleton and Window Gorges, *Esterhuysen* 10578 (BOL, PRE); Cecilia, *Barker* 4287 (NBG); Orange Kloof, *Dod* 401 (BM, BOL, K); near Constantia Nek, *Lewis* 1629 (SAM); Chapmans Peak, *Lewis* 651 (SAM); *Compton* 15441 (NBG); near Hout Bay, *MacOwan* 2555 (S); Glencairn, *Schmidt* 279 (M); S. of Simonstown, *Salter* 8553 (SAM); Witsands, *Linley* (SAM 56466).

PAARL. Near Du Toits Kloof, *Drege* 8370 (L); *Pillans* 8444 (BOL); Paarl Mts., *Drege* 8362 (K, L); Groot Drakenstein Mts., *Wasserfall* 717, 718 (NBG); Klapmuts Hill, *Marloth* 11968 (PRE).

WELLINGTON. Bains Kloof, *Worsdell* (K).

STELLENBOSCH. Jonkershoek, *Garside* 1170 A (K); *Compton* 15315 (NBG); *Wicht* (PRE 27245, BR, K, SAM); *Borchardt* (BOL).

SOMERSET WEST. Helderberg, *Stokoe* (BOL 17624); Hottentots Holland Mts., near Diep Gat, *Stokoe* (SAM 58726).

CALEDON. Steenbras, *Middlemost*, NBG 2025/26 (BOL); near Kogel Bay, *Leighton* 1423 (BOL); *Compton* 17549 (NBG); Palmiet River Valley, near Grabouw, *Bolus* 4214 (BOL, K, Z); Aries Kraal, *Lewis* 930 (SAM); *Barker* 3345 (NBG); Caledon, *Grey* (K); between Bot River and Hawston, *Pillans* 6714 (BOL, K); Lindeshof, *Lewis* 5659 (NBG); Genadendal, *Drege* 8377 (L).

WITHOUT LOCALITY. *Ecklon* and *Zeyher* 446 (BOL, S), 80 (SAM); *Thom* 272 (K); *Burchell* (K); *Drege* 8365 (K, L); *Ecklon* and *Zeyher* 77. 10 (L, Z—*I. palliderosea* Eckl.); *Sparrman* (LINN, sheet 58.31); *Burmann* (G); *Thunberg* (UPS—*I. polystachya* sheet a).

Linnaeus described *I. polystachya* in 1762 when he founded the species on a plant figured in 1757 by Miller, Ic. t. 155, f. 2, and this figure must be regarded as the type of the species since none of the three sheets named *I. polystachya* in the Linnaean Herbarium can be the type. Two of them, 58.31 and 58.33, are marked "Sp"., indicating that they were collected by Sparrman who did not sail for South Africa until ten years after the name was published. There is no note on the origin of the third sheet, 58.32, which is named *I. polystachya* with the specific names *alba* and *flexuosa* crossed out, but it does not match Miller's figure nor agree with Linnaeus' description as the portion of the plant which is mounted has an unbranched stem and the flowers are not white but appear to have been mauve with a darker stain in the middle. Its general appearance, with a spike more than 15 cm. long, on which a number of fairly large flowers are open together, is of *I. viridiflora*, and it may possibly be a cross between that species and *I. polystachya*. Sparrman's specimens on sheet 58.31 match Miller's figure, except perhaps in colouring, and are *I. polystachya*, but the plant on sheet 58.33 has a few small yellow flowers in a short compact spike and appears to be *I. odorata*.

Typical *I. polystachya* usually has a fairly tall slender branched stem, rather lax spike, short colourless bracts which are sometimes minutely flecked with brown at the apex, smallish flowers with a filiform tube about half as long as the lobes, linear diverging anthers about twice as long as the filaments and the style reaching to the top of the perianth tube with linear falcate branches emerging at the base of the filaments and equal to them in length. The length of the style is variable, however, and it sometimes extends up to the base of the anthers, but as flowers with short and long styles have been observed in the same spike, those above the base having a longer style than those below, it is not a case of the style elongating as the flower matures.

There is a great deal of variation in the size of the plants and flowers as well as the colour of the flowers which ranges from pure white or white tinged with blue or green on the outside and with or without a stain of colour in the middle, to the various shades mentioned above in the description. One of Sparrman's specimens on sheet 58.31, named *I. polystachya* by Linnaeus, has a distinct dark stain in the middle of the flower. Confusion was caused by some of the early botanists, such as Thunberg and Jacquin, who attached considerable importance to the presence or absence of a stain and used this as a character to distinguish *I. maculata* from *I. polystachya*. Several of the flower spikes figured as varieties of *I. maculata* by Jacquin on plates 21 and 22 of his Hortus Schoenbrunniensis are colour variations of *I. polystachya*, many are hybrids and none of them is *I. maculata* L.

The plant figured in 1821 on plate 530 of the Botanical Register is a colour form of *I. polystachya* with pale mauve flowers, with a small greenish stain in the centre. Plants which match this figure have been collected in the vicinity of Tulbagh. Ker named it *I. maculata* var. *caesia*, but that he was in some doubt about the difference between *I. maculata* and *I. polystachya* is clear from the following remarks he made about the former: "As a species, we confess, we can find no other line of demarcation between it and *erecta* (i.e. *I. erecta* Berg., a synonym of *I. polystachya* L.), variable in the same way and to the same extent, but the circular spot in the centre of the limb of the first, which is not in the latter, nor should we have separated the two had we not found them established by former botanists of eminence."

A form of *I. polystachya* fairly common on the Cape Peninsula has a simple or branched stem, a shorter and more compact spike than the typical, the style reaching to the middle of the filaments or base of the anthers and the anthers more or less erect and as long as the filaments or only 1—2 mm. longer. Some of these plants exactly match Jacquin's figure of *I. leucantha* and this name has therefore been cited above as a synonym of *I. polystachya*. On the lower mountain slopes at Kirstenbosch this short-spiked form occurs together with the typical but on the higher slopes above it predominates and is mixed with what appear to be hybrids with *I. odorata* which grows in the same area and flowers at the same time. Baker evidently confused *I. leucantha* with *I. campanulata* as the collections cited by him under the former are white-flowered plants of *I. campanulata* or, under the var. *aristata*, white flushed with red outside.

In the Flora Capensis Baker gave three varieties of *I. polystachya*, var. *ornata* Baker, var. *bicolorata* (Klatt) Baker and var. *flavescens* (Eckl.) Baker. The last is *I. odorata* but the identity of the other two is uncertain. The only description given for var. *ornata* is "segments tinged with red outside", and as Baker did not cite any specimens it is impossible to come to any conclusion about this. The second was a new status for *I. bicolorata* Klatt, but Baker did not see the type, which is no longer in the Berlin-Dahlem Herbarium and is presumed to have been destroyed during the last war. From Klatt's description this might perhaps have been a form of *I. dubia*.

The type of *I. hybrida* Ker (in Koenig & Sims Ann. 1: 227. 1805) is the plant figured on plate 127 in the Botanical Magazine, where it was identified as a variety of *I. flexuosa* by Curtis. No form of *I. polystachya* with the same colouring—white flushed with pink outside and with a pink stain in the middle—has been observed in the field and the plant figured is probably of hybrid origin, with *I. polystachya* as one of the parents. Baker upheld *I. hybrida* as a separate species "intermediate between *I. polystachya* and *maculata*" and described the flowers as having a distinct blotch of black in the throat (Handbk. Irid. 161 and Fl. Cap. 6: 78). Some of the collections he cited are *I. metelerkampiae* L. Bol.

No botanists have agreed about the identity of the *Ixia* figured as *Wuerthia elegans* by Regel in 1853. Klatt cited *W. elegans* as a synonym of *Ixia tenuifolia* Vahl but it is very unlikely that this is correct as Regel's figure does not agree with Vahl's description, nor do specimens in the Stockholm Natural History Museum Herbarium which were identified as *I. tenuifolia* by Klatt (see note under *I. framesii*). According to Baker *Wuerthia elegans* is a variety of *Ixia aristata* Ker (= *I. longituba* N. E. Br.), and he established it as such in his Handbook of the Iridaceae where he cited only the type figure. In the Flora Capensis he cited *Zeyher* 4014 under *I. aristata* var. *elegans*, but the flowers of Zeyher's specimens are quite unlike those of *I. longituba*, nor do they match the figure of *Wuerthia elegans*, being very much smaller with a funnel-shaped perianth tube and very short filaments included in the tube (see *I. stohriae*).

In 1928 N. E. Brown made a new combination, *I. elegans* (Regel) N. E. Br. and stated that *I. aristata* sheet *b* of Thunberg was this species, and that Thunberg's specimens were identical with unlocalised ones in Kew Herbarium collected by Dr. Thom. When I examined these plants myself I found that I could not agree about either of these statements and consider that sheet *b* of *I. aristata* Thunb. is a form of *I. campanulata* Houtt. (see note under that species), while Dr. Thom's plants are a narrow-leafed variety of *I. patens*. In both of these collections the perianth tube is very short indeed and there is no dark stain in the middle of the flower so neither matches the plant figured as *Wuerthia elegans*. In my opinion Regel's plate represents a narrow-leafed unbranched form of *I. polystachya* and I have accordingly added his name to the list of synonyms above.

Var. **lutea** (Ker) Lewis comb. nov. *I. erecta* Berg. var. *lutea* Ker, Bot. Mag. t. 846. 1805. *I. erecta* Jacq. Hort. Schoenbr. t. 18 (fig. maj.) 1797. *I. lutea* (Ker) Baker, Journ. Linn. Soc. Bot. 16: 91. 1877; Handbk. Irid. 162. 1892 et Fl. Cap. 6: 79. 1896; non Eckl. 1827. *I. aurantiaca* Klatt, Abh. Naturf. Ges. Halle 12: 397 et Erganz. 63. 1882; Dur. & Schinz, Consp. Fl. Afr. 5: 182. 1895.

Differs from var. *polystachya* in colour only, the flowers golden or orange-yellow, rarely with a small dark stain in the middle, the outer lobes sometimes reddish or purplish outside. *Filaments* yellow or dark. *Style* usually reaching to base of filaments.

Lectotype. Botanical Magazine t. 846.

Mountain slopes up to 4,000 ft. alt. in the Paarl and Stellenbosch Divisions.

Flowering period. November—December.

PAARL. Wemmershoek Mts., *Compton* 10145 (NBG); *Esterhuysen* 4101 (BOL); Wemmershoek, *Compton* 4839 (BOL, NBG); *Salter* (BOL 26914); near Pniel, *Wasserfall* 748 (NBG); Drakenstein Mts., *Galpin* 12281 (K, PRE); French Hoek Mts., *Salter* 4189 (K).

STELLENBOSCH. Banhoek, near Stellenbosch, *Stanford* (BOL 19951); Jonkershoek, *Rycroft* (BOL 26852).

Ker placed this variety as a variety of *I. erecta* Berg., a synonym of *I. polystachya* L., but Baker and Klatt both regarded it as a distinct species, the former adopting Ker's varietal epithet while the latter renamed it *I. aurantiaca*. Except for the colour of the flowers it does not differ in any way from *I. polystachya* and I have therefore followed Ker in treating it as a variety. As in var. *polystachya*, plants from higher altitudes are more slender, often with a simple stem, and have a shorter and more compact spike and smaller flowers than those at lower altitudes.

Var. **crassifolia** Lewis var. nov. *I. maculata* var. Jacq. Hort. Schoenbr. t. 19. 1797.

A var. *polystachya* tunicis cormi durioribus, foliis robustioribus marginibus plus minusve prominentibus spica densiora bracteis imbricatis aliquid striatis, differt.

Cormus subglobosus, 1—2 cm. diam., tunicis e fibris sat robustis parallelis erectis compositis. *Caulis* 25—45 cm. altus, simplex vel ramis 1—2 patentibus vel erectis. *Folia* 4—6, lanceolata vel ensiformia, firma, plerumque multinervata marginibus et nervo medio prominentibus, spiraliter torta, ad medium caulis attingentia, 0·5—1·2 cm. lata. *Spica* brevis, compacta et pauciflora vel longior et dense multiflora. *Bractea* oblonga vel oblongo-ovata, 0·5—1 cm. longa, acuta vel cuspidata, interdum tricuspidata vel cuspe et dentibus duobus brevibus instructa, sine colore vel pallide rosea, plerumque leviter striata; *bracteolae* parum ultra medium coalitae. *Flores* plerumque subparvi, subcaerulei vel lilacini vel purpurini ad medium macula cyanea vel purpurea notati: *perianthii tubus* filiformis, 0·7—1 cm. longus; *segmenta* elliptica vel obovato-oblonga, 1—1·7 cm. longa, 5—9 mm. lata. *Stamina* patentia, filamentis 3—4 mm. longis et antheris 6—8 mm. longis. *Stylus* ad apicem tubi perianthii attingens, ramis falcatis 3—4 mm. longis.

Differs from var. *polystachya* in having harder corm tunics, firmer leaves with more or less prominent margins, and a more compact spike with somewhat striate imbricate bracts.

Corm subglobose, 1—2 cm. diam.; tunics of fairly firm parallel vertical fibres. *Stem* 25—45 cm. high, simple or with 1—2 patent or erect branches. *Leaves* 4—6, reaching to about middle of stem, lanceolate or ensiform, 0·5—1·2 cm. wide, firm, usually many-veined with the margins and mid-rib prominent, spirally twisted. *Spike* short, compact and few-flowered or longer and closely many-flowered. *Bract* oblong or oblong-ovate, 0·5—1 cm. long, acute or cuspidate, sometimes tricuspidate or with a cusp and 2 short teeth, pallid or pinkish, usually striate with several slightly prominent pale nerves; *bracteoles* united to shortly above the middle. *Flowers* usually fairly small, pale blue, pinkish mauve or purplish with a dark blue or purplish stain in the middle; *perianth tube* filiform, 0·7—1 cm. long; *lobes* elliptic to obovate-oblong, 1—1·7 cm. long, 5—9 mm. wide. *Stamens* patent, often lying parallel with the lobes; filaments 3—4 mm. long; anthers 6—8 mm. long. *Style* reaching to top of perianth tube, the branches falcate, 3—4 mm. long.

HOLOTYPE. *Schelpe* 4225 in South African Museum Herbarium, National Botanic Gardens, Kirstenbosch.

Flats and hills in the Hopefield, Malmesbury and Wellington Divisions.

Flowering period. October.

HOPEFIELD. Near Hopefield, *Leipoldt* (BOL 21666, SAM); *Letty* 119 (PRE); *Bachmann* 1214 (Z).

MALMESBURY. One mile N. of Malmesbury, *Schelpe* 4225 (BOL, SAM); *Lewis* 5748 (NBG); near Riebeek Kasteel, *Leipoldt* 3819 (BOL); *Barker* 1566 (NBG); Botmas Pass, *Pillans* (BOL 26881); near Groenekloof, *Ecklon* 441 (G, K, M, PRE, S), 442 (K, M, PRE, Z); slopes of Paardeberg, *Pillans* 7784 (BOL).

WELLINGTON. Koopmans River, *Zeyher* (SAM 20930).

WITHOUT LOCALITY. *Zeyher* (K); *Lamarck* (P); *Martin* in Herb. Lamarck No. 672 (P); *Burmann* (G—2 sheets, one named *I. polystachya* var. *violacea* and other *I. erecta* vel *I. polystachya*); *Brehm* (BR).

In some collections this variety has been identified as *I. monadelpha* or *I. columellaris* (= *I. monadelpha*) but the filaments are completely free and widely spreading, the anthers in mature fully open flowers often lying more or less parallel with the lobes, and the style does not reach above the throat of the tube, with its linear branches spreading at the base of the lobes. Even when these organs are concealed in dried herbarium specimens the plants can still be distinguished from *I. monadelpha* by their more or less striate bracts which are not dark at the apex.

Among the collections cited above are some with a branched stem, short compact spikes and blue flowers with narrow elliptic lobes, which exactly match the plant figured as a variety of *I. maculata* by Jacquin on plate 19 of this Hortus Schoenbrunniensis. As has been explained above in a note under var. *polystachya*, Jacquin confused *I. maculata* with *I. polystachya* and referred to the former any colour form or variety of *I. polystachya* with a dark stain of colour in the middle of the perianth.

15. **I. flexuosa** L. (Fig. 3), Sp. Pl. ed. 2. 51. 1762 (Mill. Ic. t. 156. f. 2. 1757, sine nom.); Ker, Bot. Mag. t. 624. 1803 et Gen. Irid. 97. 1827, excl. syn. *I. capitata* Andr.; Ait. Hort. Kew. 1: 58. 1789; Klatt, Linnaea 34: 642. 1866; Baker, Handbk. Irid. 161. 1892 et Fl. Cap. 6: 78. 1896, pro parte; Dur. & Schinz, Consp. Fl. Afr. 5: 183. 1895, excl. syn. *I. thyrsiflora* De la R. *I. polystachya* D.C. in Red. Lil. t. 126. 1805.

Corm ovoid or subglobose, 0·8—1·3 cm. diam.; tunics of fine fibres, vertical below becoming confluent and reticulate above. *Stem* 35—65 cm. high, slender, often filiform, simple or with 1—3 short erect branches. *Leaves* 3—5, linear, linear-lanceolate or subulate, 5—35 cm. long, 2—5 mm. wide, erect, suberect or the outer sometimes short and more or less patent, usually 5-nerved with the mid-rib slightly prominent, usually spirally twisted. *Spike* short, compact and subcapitate, closely 3—15-flowered or occasionally slightly longer and laxer, the rachis more or less flexuose with the bracteoles adpressed to the curves. *Bract* ovate, 5—7 mm. long, shortly tricuspidate or tridentate or with a short cusp and 2 very short teeth, pellucid, usually pinkish with a few fine dark veins; *bracteoles* bicarinate, bicuspidate. *Flowers* faintly scented, small, pale pink, mauve or white, sometimes yellowish in the middle, the white flowers often with deep pink or purplish veins radiating out from the base of the lobes; *perianth tube* filiform, 4—6 mm. long; *lobes* often somewhat campanulate at the base when flowers not fully open, connate for about 1 mm., oblong, obtuse, 1—1·6 cm. long, 5—8 mm. wide, subequal or the outer slightly shorter and wider than inner. *Stamens* arising at top of perianth tube, the filaments 3·5—4·5 mm. long, fairly wide at the base and tapering upwards; anthers linear-oblong, 3—4·5 mm. long. *Ovary* rotund, 2·5—3 mm. long; style reaching to middle of filaments or base or middle of anthers, the branches oblanceolate or linear and slightly expanded towards the apex, conduplicate, 2—4 mm. long.

HOLOTYPE. Miller Ic. t. 156, f. 2.

Flats, hills and mountain slopes in clay or sandy soil.

Flowering period. August—September, occasionally also July or October.

CAPE. Near Cape Point, *Taylor* 1822 (SAM), 42 (BOL).

PAARL. French Hoek Mts., *Schlechter* 9359 (BM, BOL, BR, G, L, K, S, PRE).

STELLENBOSCH. Banhoek, *Stanford* (BOL); Jonkershoek, *Lewis* 1994 (SAM).

SOMERSET WEST. Vergelegen, *Johnson* (NBG); Hottentots Holland Mts., *Prior* (K).

CALEDON. Lower slopes of Houwhoek Mts., *Wilman* 839 (BOL, NBG); between Caledon and Bot River, *Bond* 142 (NBG); Langhoogte,

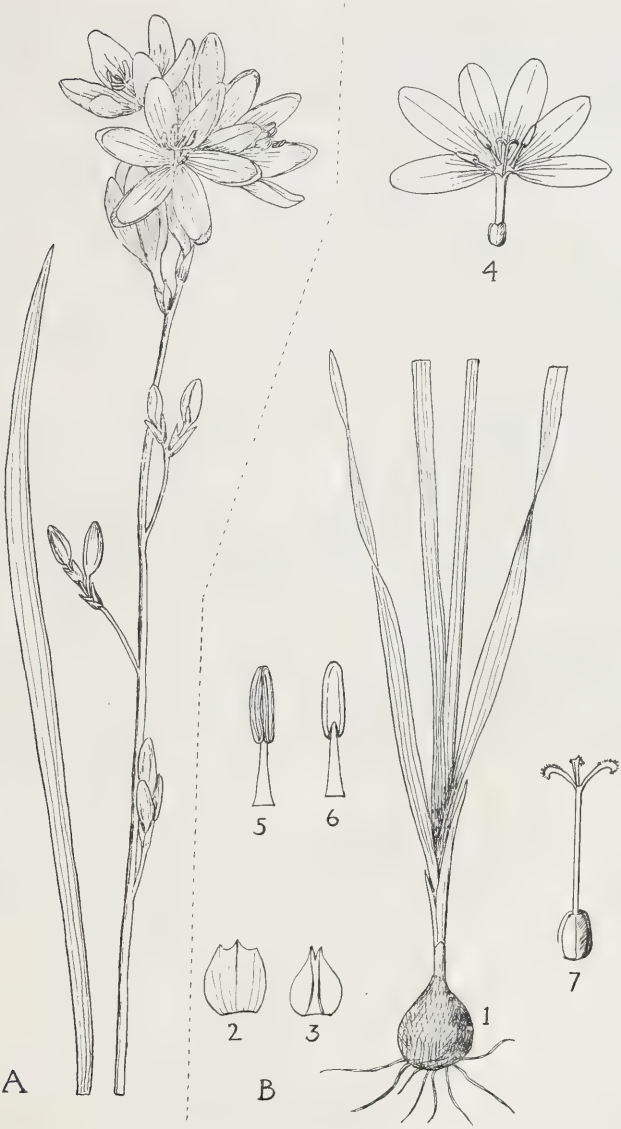


FIG. 3.—*I. flexuosa.* A. Copied from Bot. Mag. t. 624. B. *Lewis* No. 5574. 1. Corm and lower part of leaves. 2. Bract × 2. 3. Bracteoles × 2. 4. Flower laid open. 5. Stamen, front view, × 3. 6. Stamen, back view, × 3. 7. Gynaecium × 2. Del. G. J. Lewis.

near Bot River, *Ecklon* and *Zeyher* 90 (SAM); near Bot River, *Salter* 6173 (BOL); between Bot River and Hawston, *Lewis* 5291 (NBG); near Kleinmond, *Esterhuysen* 2937 (BOL); Caledon, *Garside* 78 (K); *Marloth* 7101, 9234 (PRE); *Barker* 112 (BOL, K); *Schlechter* 5554 (PRE); Swartberg, Caledon, *Worsdell* (K); between Villiersdorp and Caledon, *Barker* 111 (BOL, K); Shaws Mt., *Martley* (BOL 26932); S. of Shaws Mt., *Gillett* 4433 (BOL); between Hermanus and Stanford, *Gillett* 4169 (BR); near Stanford, *Leighton* 1938 (BOL); between Gansbaai and Danger Point, *Stokoe* (SAM 55627); between Caledon and Napier, *Esterhuysen* 3058 (BOL); Genadendal, *Pappe* (SAM 48561); *Prior* 162 (K); *Drege* 8377 (K, S); Greyton, *Lindeberg* (S); near River Sonderend, *Heginbotham* 66 (NBG); *Esterhuysen* 10359 (BOL, PRE); *Zeyher* 4012 (SAM); *Schlechter* 5621 (BM, K, SAM, Z); *Penther* 588 (Z); Appels Kraal, *Stokoe* (SAM 59778).

BREDASDORP. Fairfield, *Lewis* 5287 (NBG); near Elim, *Frowein* (PRE); *Barker* 8471 (NBG); near Bredasdorp, *Barker* 5561 (NBG); *Compton* 9041 (NBG); Soetendals Vlei, *Acocks* 15490 (PRE); the Poort, *Barker* 2507 (BOL, NBG); *Dymond* (BOL 21226, SAM); Napier, *Bond* 468 (NBG); Potberg, *Esterhuysen* 23228 (BOL); *Pillans* 9445 (PRE); Cape Agulhas, *Leipoldt* 3605 (BOL); Brandfontein, *Esterhuysen* 19019 a (BOL).

SWELLENDAM. Breederivier, near Swellendam, *Drege* 8371 (K, L, S).

HEIDELBERG. Between Swellendam and Heidelberg, *Lewis* 5574 (NBG).

RIVERSDALE. Five miles S. of Riversdale on Blombos road, *Lewis* 5635 (NBG); Vermakkelykheid, *Muir* 2697 (PRE).

WITHOUT LOCALITY. *Ecklon* and *Zeyher* (PRE—*I. palliderosea* Eckl.).

The following collections from the Clanwilliam Division appear to be a distinct form or variety of *I. flexuosa*, or may perhaps be a separate species, but as all except one of the specimens seen are incomplete, and no living plants have been seen, it is not possible to come to any decision about this at present. There is no note on the colour of the flowers which are a dull brown in the dried state but in living plants are probably deep pink or red.

CLANWILLIAM. Cedarberg, *Pattison* (BOL 13925); Clanwilliam, *Mader* 103 (K); Pakhuis Pass, *Thode* A 2138 (K).

As in the case of *I. polystachya*, Linnaeus described this species in 1762 from a plant figured by Miller five years earlier, and as there is no specimen of *I. flexuosa* in the Linnaean Herbarium, Miller's figure must be accepted as the type. It is a fairly good one of the typical common form, with a compact spike of several small flowers. There is an excellent illustration in the Botanical Magazine, t. 624, showing more details of the stamens and style, and here Ker commented on the "vague and inappropriate" name as follows: "Although Linnaeus has given it the specific name of *flexuosa*, yet in his description he says it is '*a flore ad florem parum flexus*' ".

Although they can readily be distinguished in the living state, it is difficult to define the distinction between this species and *I. polystachya* as the latter is so variable that some of its forms have characters more or less the same as those of *I. flexuosa*. On the whole *I. flexuosa* is a much more delicate species, with narrower leaves, a more slender, often hair-like stem, the spikes usually more compact and the flowers with different colouring and markings and small anthers about as long as the filaments. The corm is usually smaller, with slightly firmer tunics. It flowers in early spring and usually grows in open places on flats or hill or mountain slopes, whereas *I. polystachya* flowers from October to December and is more often found in shade or semi-shade or somewhat marshy ground, and in the typical form the stem is less slender with longer branches than in *I. flexuosa*.

I. flexuosa has at times been confused with other species, as for example in Burmann's Herbarium where several different species were placed under this name. *I. thyrsiflora* De la Roche, which Baker cited as a synonym, is *Aristea thyrsiflora* (De la R.) N. E. Br. Baker also followed Ker in citing *I. capitata* var. *stellata* Andr. Bot. Rep. t. 232 as a synonym but the plant figured by Andrew has a funnel-shaped perianth tube and is a form of *I. latifolia*. The plant described as *I. polystachya* var. *flexuosa* by Lamarck (Encyc. 3: 339 (1789)) is probably *I. odorata*, judging from his description and a specimen in his herbarium named by him "*I. polystachya* var.".

16. **I. stolonifera** Lewis, Ann. S. Afr. Mus. 40: 14. 1952.

Corm small, globose, 5—8 mm. diam.; tunics of very fine submembranous reticulate fibres. *Stem* 21—50 cm. high, usually about 40 cm., simple or with 1 short branch near the top. *Basal sheaths* 2, membranous, 2·5—8·5 cm. long; short stolons bearing clusters of very small bulbils at the apex arise in the axils of the sheaths and corm tunics. *Leaves* 3, suberect, lanceolate, 18—30 cm. long, 0·3—1 cm. wide, flaccid, half sheathing. *Spike* 3—6 cm. long, closely 6—12-flowered. *Bract* 7—8 mm. long, tricuspidate, the cusps with long setaceous tips 3—4 mm. long, pellucid, mauve at the base with 3 or 5 purplish veins; *bracteoles* bifid with 2 long setaceous cusps. *Flowers* small, pale greyish mauve with a small purple circular stain in the middle; *perianth tube* cylindrical, 2—4 mm. long, not exserted from the bract; *lobes* ovate, 0·9—1·2 cm. long, 6—7 mm. wide. *Stamens* arising at top of perianth tube, the filaments 2 mm. long, purple; anthers yellow, 5—6 mm. long. *Ovary* ovoid, about 3 mm. long; style reaching to base of anthers, the branches patent, 3 mm. long, linear, conduplicate, minutely ciliate towards the apex.

HOLOTYPE. *Lewis* 1605 in South African Museum Herbarium, National Botanic Gardens, Kirstenbosch.

Shaded mountain slopes at about 3,000 ft. altitude on the borders of the Montagu and Worcester Divisions.

Flowering period. September.

MONTAGU. Kiesiesberg, lower slopes, 3,000 ft., *Lewis* 1605 (BOL, NBG, SAM); *Compton* 18524 (NBG).

I. stolonifera is known only from the one locality recorded above. The long setaceous cusps of the bracts and bracteoles distinguish it from *I. polystachya* and *I. flexuosa*, its nearest allies. The bulbiferous stolons are uncommon in the genus but are known to occur also in *I. polystachya*, *I. maculata* and *I. paniculata*.

17. **I. viridiflora** Lam. Encyc. 3: 340. 1789 et Illustr. 1: 112. 1791; Lodd. Bot. Cab. t. 1548. 1829; Klatt, Abh. Naturf. Ges. Halle 12: 397. 1882; Baker, Handbk. Irid. 164. 1892 et Fl. Cap. 6: 82. 1896; Dur. & Schinz, Consp. Fl. Afr. 5: 186. 1895; Marloth, Fl. S. Afr. 4: 146. t. 42 c. 1915. *I. maculata* var. Thunb. Diss. Ix. n. 19. 1783, pro parte. *I. maculata* var. *viridis* Jacq. Hort. Schoenbr. t. 23. 1797; Ker, Bot. Mag. t. 549. 1802; Reichb. Fl. Exot. 4. t. 256. 1835. *I. spectabilis* Salisb. Prodr. 35. 1796. *I. spicata* var. *viridi-nigra* Andr. Bot. Rep. t. 29. 1799. *I. viridis* Thunb. Fl. Cap. 1: 242. 1811 et Ed. Schultes 62. 1823. *I. pulchra* Salisb. Trans. Hort. Soc. 1: 320. 1812. *I. prasina* Soland. ex Baker in Journ. Linn. Soc. Bot. 16: 92. 1877, *nomen nud.*

Corm subglobose, 1—2 cm. diam., usually about 1 cm.; tunics of pale brown fairly fine reticulate fibres. *Stem* 50—95 cm. high, simple or occasionally with 1—2 short erect branches. *Leaves* 5—7, linear, erect, 40—55 cm. long, 2—4 mm. wide, fairly prominently 4—6-nerved, often reaching to or above the base of the terminal spike. *Spike* 12—30 cm. long, 12—many-flowered, usually lax and with many flowers open together, occasionally shorter and more compact. *Bract* oblong, obtuse or acute, 0·8—1 cm. long, opaque, straw-coloured, with 1 distinct vein; *bracteoles* slightly shorter than bract, bicarinate, bidentate. *Flowers* largish, green with a conspicuous purple, purple-black or reddish circular stain in the middle; *perianth tube* filiform, 6—9 mm. long, sometimes becoming curved as the flower matures; *lobes* connate for about 1 mm., patent, subequal, oblong, obtuse or subacute, 1·6—2·5 cm. long, 0·7—1·1 cm. wide. *Stamens* arising at throat of perianth tube, the filaments purple, 3—4 mm. long; anthers purple or yellow, linear, subacute, 0·9—1·3 cm. long. *Ovary* oblong or obovoid, about 4 mm. long; style reaching to top of perianth tube, the branches falcate, 3 mm. long, linear, conduplicate, minutely ciliate.

Holotype. *Lamarck* in Herb. Lamarck, Natural History Museum Herbarium, Paris.

Lower slopes of mountains in the Tulbagh district.

Flowering period. September—October.

TULBAGH. *Pappe* (S); *Thunberg* (S, UPS); *Ecklon* and *Zeyher* 89 (G); *Ecklon* and *Zeyher* (76.9) (BR, PRE, UPS, Z); *Ecklon* 439 (G, K, M, PRE, Z); *MacOwan* 2692 (K); HNAA 542 (BM, BOL, G, K, UPS); *Sidey* 2399 (S); *Brehm* (BR, M); between Breede River and Bokkeveld, *Drege* (K).

Without Locality. *Drege* (G, L); *Drege* 8360 (P); *Lamarck* (P); *Masson* (LINN); *Jussieu* 3620 (P); *Burchell* (K); *Pappe* (BM, K); *Prior* (K, PRE); *Thom* 974 et *s. n.* (K); *Villett* (K); *Roxburgh* (BM); *Niven* (BM); *Harvey* 844 (BM, K); *Verreaux* (G); *Ecklon* and *Zeyher* 277 (G); *Ecklon* 440 (K, M, PRE); *Zeyher* (K—locality given is Clanwilliam Div. but this is probably incorrect).

The striking and uncommon colour of the flowers, usually long and comparatively lax spike and very long narrow anthers, distinguish this species from all others. As a rule a number of flowers on the spike are open together and persist for several days without fading and falling off as is usual in the genus. A less common form has a shorter and more compact spike and flowers with a reddish or maroon stain in the middle instead of the more typical purple or purple-black. Both forms were beautifully illustrated by Jacquin in 1797 on plate 23 of his Hortus Schoenbrunniensis.

In his Handbook of the Iridaceae and the Flora Capensis Baker gave two varieties, var *cana* (Eckl.) Baker, based on *I. cana* Eckl. (Top. Verz. 26, 1827), and var. *caesia* (Ker) Baker, the latter figured in 1821 on plate 530 of the Botanical Register where it was named *I. maculata* var. *caesia* by Ker. For the first Baker cited *I. maculata* var. *amethystina* Ker, Botanical Magazine t. 789, but having examined this figure and some specimens distributed by Ecklon as *I. cana* I am fairly certain that it is a hybrid, with *I. viridiflora* as one of the parents. The second is a form of *I. polystachya* and is discussed in a note under that species.

For two hundred years or more *I. viridiflora* has been a favourite of horticulturalists and it is now in danger of being exterminated in the Tulbagh district, the only area from which it has been recorded, though according to Marloth it occurred at one time in the Piketberg and Clanwilliam districts as well. For the present it is fairly well established in a few gardens and nurseries in Europe and South Africa and it is hoped that every effort will be made to preserve it in future.

Dr. Marloth, in his Flora of South Africa (vol. 4. p. 146), made the following note on the colour of the flowers: "The colour of the centre is not really black, but a dark indigo, due to the deep blue sap of the cells of the upper epidermis. The green portion contains no green pigment, the colour being due to the effects of interference of light, caused by the finely striated outer cell-wall and the highly refractive contents of the epidermal cells. In some of the inner cells of the petals occur very refractive angular granules, embedded in pale blue protoplasm, and these two substances may have a share in the production of the final result."

18. **I. patens** Ait. Hort. Kew. 1: 59. 1789; Sims, Bot. Mag. t. 522. 1801; Red. Lil. t. 140. 1806; Willd. Enum. 1: 56. 1809; Lodd. Bot. Cab. t. 1142. 1826; Reichb. Fl. Exot. 4. t. 256. 1835; Klatt, Linnaea 34: 646. 1866; Baker, Handbk. Irid. 163. 1892, et Fl. Cap. 6: 80. 1896; Dur. & Schinz, Consp. Fl. Afr. 5: 186. 1895. *I. patens* var. *kermesina* Regel, Gartenfl. t. 356. 1862. *Gladiolus pyramidalis* Burm. f. Prodr. Fl. Cap. 2. 1768. *Ixia aristata* sensu Schneev. Ic. t. 32. 1793. *I. flaccida* Salisb. Prodr. 35. 1796. *I. filiformis* Vent. Hort. Cels. t. 48. 1800; Red. Lil. t. 30. 1803; Vahl, Enum. 2: 63. 1806. *I. coccinea* Thunb. Fl. Cap. 1: 241. 1811, pro parte. *I. candida* Del. in Red. Lil. t. 426. 1814. *I. pallens* Ait. ex Steud. Nomen. 453. 1821. *I. densiflora* Klatt, Abh. Naturf. Ges. Halle 12: 397 et Erganz. 63. 1882. *I. angusta* L. Bolus, S. Afr. Gard. 21: 368. 1931; non Jacq. 1786—93. *I. dispar* N. E. Br. Kew Bull. 1929. 133—4. *I. campanulata* sensu Baker, Handbk. Irid. 162 et Fl. Cap. 6: 80. *I. punicea* Eckl. Top. Verz. 24. 1827, *nomen nud.*

Corm subglobose, 1·5—2 cm. diam.; tunics of fairly fine more or less reticulate fibres. *Stem* 18—50 cm. high, moderately stout, simple or with 1—2 short erect branches. *Basal sheaths* 2 or 3, 1—6·5 cm. long. *Leaves* 5—7, lanceolate or ensiform, ascending or erect, 10—35 cm. long, 0·6—1·2 cm. wide, reaching to middle of stem or sometimes to the top, often slightly twisted, firm with several fairly prominent veins and often narrow somewhat cartilaginous fairly prominent margins. *Spike* up to 10 cm. long, somewhat laxly 5—15-flowered, the rachis slightly flexuose with the bracteoles adpressed to the curves. *Bract* oblong or obovate-oblong, 6—8 mm. long, cuspidate, tricuspidate, tridentate or with a cusp and 2 short teeth, more or less pellucid, usually pinkish and faintly striate, or minutely speckled with brown; *bracteoles* bicarinate, bicuspidate. *Flowers* deep crimson, rose-purple or pale pink, rarely white, sometimes with a very small white or greenish circular mark at the centre and usually with well defined veins; *perianth tube* slender, usually filiform, 4—6 mm. long; *lobes* connate for 1—2 mm., patent, narrowly elliptic or oblong, obtuse, 1·6—2·4 cm. long, 0·5—1·2 cm. wide, equal or the outer slightly to distinctly wider than inner. *Stamens* arising at top of perianth tube, erect, the filaments 4—6 mm. long; anthers linear, 6—8 mm. long. *Ovary* rotund, 3—4 mm. long; style reaching to base of anthers or shortly above, the branches linear-oblanceolate, conduplicate, 3—4 mm. long, the upper third minutely ciliate.

Holotype. Hort. Kew. specimen (1778) in the British Museum.

Original locality somewhat doubtful as there are no recent authentic records but it probably extended from Clanwilliam to the Worcester and Caledon Divisions.

Flowering period. September—October.

CALVINIA. Grasberg, *Buhr*, NBG 296/36 (NBG); Nieuwoudtville, *Buhr*, STE 661 (BOL, type of *I. angusta* L. Bolus); STE 3760 (BOL). (These localities are doubtful as the plants are all from Mr. Buhr's garden).

CLANWILLIAM. *Mader* in Herb. MacOwan 2182 (K).

TULBAGH. *Pappe* (BM, SAM).

WORCESTER. Near Worcester, *Cooper* 3611 (K, type of *I. dispar*).

CALEDON. Near River Sonderend, *Galpin* 4684 (K, PRE).

Without Locality. *Burmann* (G, type of *Gladiolus pyramidalis*); *Pappe* (BOL, SAM); *Zeyher* (SAM); *Thom* (K); *Drege s. n.* et 8359 (G); *Drege* 8358, 8378 (S); *Ventenat* (G, type of *I. filiformis*); *Burchell* (K); *Jussieu* 3621 (P); *Thunberg* (UPS, *I. coccinea* sheet b); *Jameson* (K); *Drege* (S—"Rondebosch, Witteboom und Zwischen Wynberg und Houtbaai"); *Thom* (K); *Brehm* (BR); *Ecklon* (S, *I. punicea* Eckl.).

It seems fairly certain that this beautiful species has been exterminated as there are no recent collections from the field. That it was a popular garden plant and largely cultivated in England and Europe during the second half of the eighteenth and early part of the nineteenth centuries is evident from the number of times it was figured and the various names by which it was known. In 1801 Sims noted in the Botanical Magazine, t. 522, that "this very shewy Ixia, the brilliancy of whose flowers it is impossible to imitate by art, . . . has been of late years frequently imported from Holland."

The first name to be published for this species is that of Burmann f., who in 1768 described a plant in his herbarium as *Gladiolus pyramidalis*. When N. E. Brown examined the South African Iridaceae in Burmann's herbarium he overlooked the type of *G. pyramidalis* and for various reasons came to the conclusion that a *Watsonia* specimen must have been the plant described, but as I explained in 1954 in a note published in the Annals of the South African Museum (Vol. 40, p. 132), the type, named by

Burmann, is in his herbarium and agrees with his description. However, his specific epithet cannot be used for this species as a species of *Lapeirousia* was named *Ixia pyramidalis* by Lamarck in 1789 (Encyc. 3: 334). The same year Aiton described plants of this *Ixia*, introduced into Kew Gardens by William Pitcairn ten years earlier, as *I. patens*, and as this is the oldest available name it is retained for the species. The type, which flowered at Kew in 1788, is in the British Museum Herbarium.

The plant described as *I. angusta* by Dr. L. Bolus has unusually narrow perianth lobes, only 3—6 mm. wide, and is an abnormal form; plants from the same collection which flowered two or three years later had larger flowers with lobes up to 1·7 cm. long and 1 cm. wide.

The type of *I. densiflora* Klatt has not been seen and is presumed to have been destroyed but from the description it is very possible that it was a form of *I. patens* and I have therefore followed Baker in citing *I. densiflora* Klatt as a synonym.

In Thunberg's herbarium there are two sheets named *I. coccinea*, the first being *I. campanulata* Houtt. and the second *I. patens*. There is a slight superficial resemblance between these two species but the corm and corm tunics are quite different, the leaves of *I. patens* are wider and firmer, the bracts longer, and there is a distinct difference in the texture and appearance of the flowers.

N. E. Brown pointed out that Baker had incorrectly described a plant from Worcester, *Cooper* 3611, as *I. campanulata* Houtt., and as he considered that it was a new species he named it *I. dispar*. There is a single specimen in Kew Herbarium and as far as can be seen—there are no flowers open—it is a small-flowered form of *I. patens*. It is very similar to *Mader* in Herb. MacOwan No. 2182, from the Clanwilliam Division, but has slightly longer and narrower leaves.

In the Bolus Herbarium there are some plants collected by Ross-Frames between Villiersdorp and Worcester (BOL 19913 and 26853) which also resemble *Cooper* 3611, but the flowers are pale pink or white with the outer lobes sometimes flushed with red outside. Some unlocalised specimens in Kew Herbarium, collected by Dr. Thom, are almost the same as those of Ross-Frames. They were identified as *I. leucantha* by Baker and N. E. Brown, but compared with Jacquin's figure of *I. leucantha* the plants are shorter and distinctly sturdier with firmer leaves, more acute bracts, a shorter perianth tube and comparatively longer lobes with more distinct veins. Except that the lobes are obtuse instead of acute these specimens match Redouté's figure of *I. candida*, which has generally been assumed to be the same as *I. leucantha* Jacq., but seems rather to be a white-flowered, acute-lobed form of *I. patens*, whereas *I. leucantha* is almost certainly a form of *I. polystachya*.

Var. **linearifolia** Lewis var. nov.

A var. *patenti* ita differt. Folia angustiores lineares: spica densior: tubus perianthii paulo brevior.

Folia linearia, 1·5—2 mm. lata, costata, apicem versus spiraliter torta. *Spica* compacta, dense 5—8-flora. *Flores* rosei vel purpurini, var. *patenti* similes sed tubo perianthii paulo breviore, circa 3 mm. longo, non e bractea exserto; *segmenta* elliptica subobtusa, circa 2 cm. longa, 1 cm. lata.

Differs from var. *patens* in having narrower leaves, the spike more compact and perianth tube slightly shorter.

Leaves linear 1·5—2 mm. wide, costate, spirally twisted towards the apex. *Spike* compact, closely 5—8-flowered. *Flowers* deep pink or purplish, as in var. *patens* but the perianth tube slightly shorter, about 3 mm. long, not exserted from the bract; *lobes* elliptic, subobtuse, about 2 cm. long, 1 cm. wide.

HOLOTYPE. *Thom* in Kew Herbarium.

Flowering period. September.

CALEDON. Villiersdorp, *Loubser* 384 (BOL).

WITHOUT LOCALITY. *Thom* (K).

Dr. Thom's unlocalised collection was named *I. elegans* by N. E. Brown in 1928 (Journ. Linn. Soc. Bot. 48: 43), a new status for *I. aristata* var. *elegans* (Regel) Baker, a variety which Baker based on *Wuerthia elegans* Regel. Brown also identified Thom's plants with sheet b of *Ixia aristata* in Thunberg's herbarium, but after examining these specimens myself I found that I could not agree with these identifications. Sheet b of Thunberg's *I. aristata* is discussed in a note under *I. campanulata* Houtt., and I consider it to be that species, while in my opinion the figure of *Wuerthia elegans* represents a narrow-leafed form of *I. polystachya* L.; the bracts are shown very short, as is usual in that species, and the perianth tube well exserted and more than twice as long as in Thom's plants. In addition, two of the three specimens on Thom's sheet have concolorous flowers whereas the plant figured as *Wuerthia elegans* has pale mauvish pink flowers with a darker circular stain in the middle. These two specimens exactly match a plant collected near Villiersdorp by Mr. Loubser and Miss Barker agrees with me in considering these to be a narrow-leafed variety of *Ixia patens*.

The third specimen on Thom's sheet, on the left side, does not match the other two and is *I. vinacea* Lewis. Its flowers have a dark circular stain in the middle, short filaments with long anthers, and the style reaches to the top of the tube with dark falcate branches spreading at the base of the filaments.

19. **I. conferta** Foster, Contrib. Gray Herb. No. 114: 47. 1936. *I. capitata* var. *ovata* Andr. Bot. Rep. t. 23. 1798. *I. ovata* (Andr.) Sweet, Hort. Brit. 499. 1827. *I. ovata* (Andr.) Klatt, Abh. Naturf. Ges. Halle 12: 396 et Erganz. 62. 1882; Baker, Handbk. Irid. 164. 1892, et Fl. Cap. 6: 82. 1896; Dur. & Schinz, Consp. Fl. Afr. 5: 185. 1895; Marloth, Fl. S. Afr. 4: 146. t. 42 e. 1915.

Corm ovoid or subglobose, 1—1·5 cm. diam.; tunics of coarse somewhat ligneous fibres, vertical below, becoming confluent and more or less reticulate above the middle. *Stem* fairly slender, simple, 15—35 cm. high. *Basal sheaths* 2, 1—5 cm. long, acute or acuminate, usually green towards the apex. *Leaves* 5—6, distichous, lanceolate or occasionally ensiform, 7—24 cm. long, 0·3—1·1 cm. wide, reaching to about the middle of the stem or a little above, suberect to erect or sometimes patent, spirally twisted, firm, several-veined with the mid-rib prominent and narrow cartilaginous margins. *Spike* short, capitate, closely 2—7-flowered, occasionally up to 10. *Bract* obovate, 0·7—1·1 cm. long, acute or with a cusp and 2 short teeth, the lower third opaque, pale, many-veined, the upper part papyraceous, ferruginous or densely streaked with fine reddish brown lines, somewhat lacerated at the apex; *bracteoles* bifid, bicarinate and cuspidate. *Flowers* fairly large, purplish or red with a purple-black circular stain in the middle; *perianth tube* cylindrical, slender, 6—9 mm. long; *lobes* connate for 1—2 mm., oblong or ovate, obtuse, narrowed to the base and sometimes subunguiculate with elliptic interstices between the lobes, 1·3—2·5 cm. long, 0·8—1·7 cm. wide, equal or the outer slightly wider than inner. *Stamens* arising at top of perianth tube, erect, the filaments 3·5—5 mm. long; anthers linear, subsagittate, 7—9 mm. long, purplish. *Ovary* rotund, 3—4 mm. long; style reaching to base of filaments, the branches falcate, linear or oblanceolate, conduplicate, 3—3·5 mm. long, purple, the upper half or more minutely ciliate.

HOLOTYPE. Andrew's Bot. Rep. t. 23.

Sandy flats, usually in damp ground, in the Clanwilliam, Piketberg and Tulbagh Divisions.

Flowering period. August—September.

CLANWILLIAM. Warm Baths, *Edwards* (BOL 14439).

PIKETBERG. Near Piketberg, *Bolus* 13649 (BOL); Porterville, *Roux*, NBG 204/27 (BOL, NBG).

TULBAGH. De Hoek, Saron, *Barker* 5833 (BOL, NBG); *Wilman* 738 (BOL).

This handsome species is allied to *I. maculata* from which it differs in having much harder and more or less woody corm tunics, flowers of a different colour, the filaments free, and the style not reaching above the top of the perianth tube with its branches spreading on the base of the lobes between the filaments. It was figured and described by Andrew in 1798 as a variety of *I. capitata*, a synonym of *I. maculata*, but in 1827 Sweet raised it to specific status and since then all botanists have agreed in regarding it as a distinct species, though it was not until more than a hundred years later that Foster renamed it *I. conferta*. As he explained, "Burmann's name (*I. ovata* Burm. f. = *Geissorrhiza ovata* (Burm. f.) Aschers. & Graebn.) stands as a bar to *I. ovata* (Andr.) Sweet, which is based upon *I. capitata* var. *ovata* Andr. Apparently unaware that Sweet had made this change in status, Klatt made the same change to *I. ovata* (Andr.) Klatt, basing it upon a reference to Andrew's plate".

In the Flora Capensis (Vol. 6, p. 82) Baker placed *I. stellata* (Andr.) Klatt, based on *I. capitata* var. *stellata* Andr. Bot. Rep. t. 232, as a variety of *I. ovata* (Andr.) Klatt, but the plant figured by Andrew has a funnel-shaped perianth tube so belongs in the section *Morphixia*, and is a form of *I. latifolia* De la Roche. On page 78 of the same work Baker cited *I. capitata* var. *stellata* Andr. as a synonym of *I. flexuosa* L.

Var. **ochroleuca** (Ker) Lewis comb. nov. *I. maculata* L. var. *ochroleuca* Ker, Bot. Mag. t. 1285. 1810; Baker, Handbk. Irid. 163. 1892, et Fl. Cap. 6: 81. 1896. *I. ochroleuca* (Ker) G. Don in Sweet Hort. Brit. ed. 2. 502. 1830; Loudon Ladies' Fl. Gard. t. 18. 1841; Klatt, Abh. Naturf. Ges. Halle 12: 397. 1882; Dur. & Schinz, Consp. Fl. Afr. 5: 185. 1895; non Vahl. 1806. *I. alboflavens* Eckl. Top. Verz. 27. 1827, *nomen nud. I. lutea* Eckl. l. c. 24, *nomen nud.*

Differs from var. *conferta* in having whitish to sulphur-yellow flowers with a brown to purple-black stain in the middle, and the flowers and plant usually slightly larger.

Corm 1—2·5 cm. diam., as in var. *conferta*. *Stem* 15—50 cm. high, usually 20—30 cm. *Leaves* 4—6, 10—25 cm. long, 0·3—1·5 cm. wide, as in var. *conferta*. *Spike* short, capitate, 3—10-flowered. *Bract* obovate, sometimes carinate, 0·7—1·2 cm. long, cuspidate or with a cusp and 2 rounded lobes or short teeth, pale yellowish white and semipellucid or opaque, several-veined, the upper half sometimes purplish, more often papyraceous, ferruginous and densely speckled or streaked with brown or reddish brown as in var. *conferta*. *Flowers* large or fairly large, cream-coloured or pale yellow (usually sulphur-yellow when dried) with a brown to purplish black stain in the middle; *perianth tube* 0·8—1·2 cm. long; *lobes* 1·7—3 cm. long, 0·9—2 cm. wide, equal, oblong, obovate or suborbicular and shortly and broadly unguiculate or subunguiculate, often with elliptic or rounded interstices at the base. *Androecium* and *gynaecium* as in var. *conferta*, the style branches sometimes up to 5 mm. long.

LECTOTYPE. Botanical Magazine t. 1285.

In clay or gravel soil on flats and hills.

Flowering period. September—October.

CLANWILLIAM. Warm Baths, *Edwards* (BOL 14438).

PIKETBERG. Near Piketberg, *Penther* 603 (M, Z); *Barker* 270 (NBG); *Lewis* (BOL 22248); Berg River, near Piketberg, *Schlechter* 5275 (BOL, BR, G, PRE, Z); between Piketberg and Berg River Bridge, *Barnes* (BOL); between Piketberg Road Station and Piketberg, *Bolus* (BOL 21996); Groenvlei, *Guthrie* 2701 (NBG); Porterville, *Roux*, NBG 203/27 (NBG); near Porterville, *Loubser* 460 (NBG).

TULBAGH. Winterhoek, *Ecklon* 85 (G, SAM); Tulbaghskloof, foot of Winterhoeksberg, Witsenberg and Vogelvallei, *Ecklon* and *Zeyher* (PRE, UPS, *I. lutea* Eckl.).

HOPEFIELD. Near Hopefield, *Bachmann* 1215 (Z).

MALMESBURY. Groenekloof, *MacOwan* 2914, HNAA 941 (BM, BOL, G, K, SAM, UPS); 1 mile N. of Oudepost, near Berg River, *Schlechter* 5275 (BM, BR, K, UPS); *Salter* 4770 (BOL); 1 mile S. of Berg River Bridge, *Salter* 3665 (BM); near Darling, *Bolus* 12842 (BOL, PRE); Malmesbury, *Schlechter* 1622 (BM, G, K, Z); near Paardeberg, *Ecklon* 445 (M, K, PRE, *I. alboflavens* Eckl.); between Malmesbury and Riebeek Kasteel, *Leipoldt* 3028 (BOL, NBG, PRE).

WELLINGTON. Near Huguenot Station, *Lewis* 1608 (SAM).

PAARL. Lange Vallei, Agter Paarl road, *Lewis* 4440 (SAM).

WITHOUT LOCALITY. *Thunberg* (G); *Drege* (G); *Marloth* 1753 (PRE).

Except for the different colour of the flowers, and the fact that they are usually slightly larger, there is no character by which this can be distinguished from *I. conferta* and in my opinion it cannot be regarded as more than a distinct colour variety of that species. In the Flora Capensis Baker followed Ker in placing it as a variety of *I. maculata*, but as I have explained in a note under that species, there was complete confusion about the identity of *I. maculata* L. and various other species with a dark circular stain in the middle of the flower were identified as *I. maculata*, or varieties of *I. maculata*, by Thunberg, Jacquin, Ker and other early botanists.

In *I. conferta* var. *ochroleuca* there is considerable variation in the bracts and the flowers, the former varying from pale yellowish white and opaque all over to pale and somewhat pellucid in the lower half and more or less papery and rust-coloured above, and the flowers from cream-coloured with a brown centre and large almost orbicular and distinctly unguiculate lobes with rounded interstices, matching the type figure, to yellowish white with a purple-black centre and more or less oblong subunguiculate lobes. These forms are connected by intermediates.

In the vicinity of Porterville both varieties and hybrids between them were collected by Mr. J. W. Loubser (Nos. 459 and 461 in the Compton Herbarium).

I. alboflavens Eckl. and *I. lutea* Eckl. are almost certainly forms of var. *ochroleuca*, judging from the descriptions of the colours of the flowers and specimens seen which were distributed under these names. In the National Herbarium, Pretoria, there is a plant of *I. odorata* Ker collected in the Clanwilliam Division—Olifants River and at Villa Brakfontein—which was issued as *I. alboflavens* Eckl., but this must be due to some error as the flowers do not agree with Ecklon's description nor was that locality mentioned by him. In a capsule on the sheet there are two flowers of *I. conferta* var. *ochroleuca*, but the remainder are *I. odorata*.

It is possible that *I. nigro-albida* Klatt (Abh. Naturf. Ges. Halle 12: 396. 1882) may be this variety but there is some doubt about it. Klatt gave as a synonym *I. capitata* var. *flore albo, fundo nigro* Andr. Bot. Rep. t. 159, and cited two collections, *Zeyher* 1600 and *Pappe* in Herb. Lubeck. I have not seen either of these and they are presumed to have been destroyed, but there are several collections of *Zeyher* 1600 in Kew, the South African Museum Herbarium and elsewhere and all that have been examined are *I. dubia* Vent. They are not the same as the plant figured by Andrew, which has large white flowers with a very dark, almost black stain, similar to those of some forms of *I. conferta* var. *ochroleuca* except that the lobes are not shown narrowed to the base and unguiculate or subunguiculate. In addition bulbils are shown at the base of the corm, though none have been observed in material from the field, which makes me suspect that Andrew's plant might be a hybrid.

20. **I. versicolor** Lewis sp. nov.

Cormus ovoideus vel subglobosus, 1—1·5 cm. diam., tunicis e fibris fuscis subrobustis compositis. *Caulis* simplex, 15—35 cm. altus. *Folia* 5—6, disticha, linearia vel lineari-lanceolata, spiraliter torta, suberecta vel erecta plerumque ad medium caulis vel interdum apicem versus attingentia, 2—5 mm. lata, firma, nervo medio prominenti et marginibus involutis cartilagineis plus minusve crenulatis. *Spica* brevis, capitata, 3—7-flora. *Bractea* obovata vel ovata, 5—7 mm. longa, carinata, cuspidata, aliquando cuspe et dentibus vel lobis duobus brevibus instructa, pellucida vel caeca, supra medium lilacina, saepe substriata; *bracteolae* bicarinatae bicuspidatae. *Flores* versicolores, albi lobis exterioribus extrinsecus rubido-brunneis vel purpurei vel caeruleo-purpurei, semper ad medium macula fusca notati; *perianthii tubus* e bractea exsertus, filiformis, 0·8—1·2 cm. longus, saepe in basi segmentorum intrusus; *segmenta* per circa 1 mm. connata, subreflexa, oblonga vel obovato-oblonga, obtusa, 1·2—1·7 cm. longa, 6—9 mm. lata. *Stamina* erecta, ad apicem tubi perianthii orta, filamentis circa 2·5 mm. longis et antheris linearibus 5—6 mm. longis. *Ovarium* rotundum, 2—3 mm. longum; stylus ad apicem tubi perianthii attingens, ramis falcatis linearibus conduplicatis 3—4 mm. longis, dimidia parte superiore minute ciliata.

Corm ovoid or subglobose, 1—1·5 cm. diam.; tunics of fairly coarse dark fibres, reticulate above the middle, parallel and vertical below. *Stem* simple, 15—35 cm. high. *Leaves* 5—6, distichous, linear or linear-lanceolate, spirally twisted, suberect to erect, usually reaching to middle of stem but sometimes nearly to the top, 2—5 mm. wide, firm with the midrib prominent and involute cartilaginous more or less crenulate margins. *Spike* short, capitate, 3—7-flowered. *Bract* obovate or ovate, 5—7 mm. long, carinate, cuspidate, occasionally with a cusp and 2 short teeth or lobes, pellucid or opaque, the upper half pale or bright magenta-purple, often faintly striate with a few slightly raised nerves; *bracteoles* bicarinate, bicuspidate. *Flowers* variable in colour, white with the outer lobes dull reddish brown outside, or purple or bluish purple, always with a dark brown or blackish stain in the middle; *perianth tube* exserted from bract, filiform, 0·8—1·2 cm. long, often indented into the base of the lobes; *lobes* connate for about 1 mm., slightly reflexed, oblong or obovate-oblong, obtuse, 1·2—1·7 cm. long, 6—9 mm. wide. *Stamens* erect, arising at top of perianth tube; filaments about 2·5 mm. long; anthers linear, 5—6 mm. long, slightly spreading at the base and connivent at the apex. *Ovary* rotund, 2—3 mm. long; style reaching to top of perianth tube, the branches 3—4 mm. long, falcate, linear, conduplicate, with the upper half minutely ciliate.

HOLOTYPE. *Lewis* in the Bolus Herbarium (No. 21758).

Sandy flats in the Paarl, Stellenbosch and Somerset West Divisions.

Flowering period. October.

PAARL. Simondium, *Stanford* (BOL 26863).

STELLENBOSCH. Kuils River, *Stanford* (BOL 26864, 26866).

SOMERSET WEST. Between Gordons Bay and the Strand, *Lewis* (BOL 21758, 21759); *Parker* 4269 (BOL, K, NBG); Hottentots Holland Mts., *Prior* (K).

WITHOUT LOCALITY. *Drege* (G); *Ecklon* and *Zeyher* 78 (G); *Rogers* (K).

On flats near the coast between Gordons Bay and the Strand plants with mauve and others with white flowers have been found growing together.

This small few-flowered species is near *I. conferta* and *I. dubia.* It has smaller bracts and flowers than the former, with a comparatively longer perianth tube and more spreading, usually slightly reflexed lobes, while from *I. dubia* it differs in having more erect stamens with the anthers connivent at the apex and the style only reaching to the top of the perianth tube with its branches spreading at the base of the filaments. From these and other species it is distinguished by the raised, slightly involute and crenulate leaf margins, and the way in which the perianth tube is often slightly indented into the base of the lobes, a feature which shows most clearly in the buds and has not been observed in any other species. Some of the collections have been identified as *I. columellaris* Ker (= *I. monadelpha*) but it differs in having the filaments free, with the style branches spreading between them at the base.

21. **I. rouxii** Lewis, S. Afr. Gard. 21: 368. 1931.

Corm ovoid, about 1·5 cm. diam.; tunics of fairly coarse fibres, vertical below, becoming confluent and reticulate above the middle. *Stem* firm, moderately slender, 35—55 cm. high, with 1—3 short stiff branches spreading at an angle of 45—90 degrees, the spikes few-flowered, curved up and erect. *Leaves* 4—6, linear or linear-lanceolate, erect, 15—35 cm. long, 2—6 mm. wide, reaching to or above middle of stem, few-veined. *Spike* short, capitate, closely 3—9-flowered. *Bract* ovate or oblong, 5—6 mm. long, acute or shortly cuspidate, sometimes with a short cusp and 2 very short teeth, colourless or with several faint pinkish veins or minutely brown-flecked at the apex; *bracteoles* as long as bract, bicarinate, shortly bicuspidate. *Flowers* white, pink, bluish green or yellow flushed with blue, green or cerise and with a large conspicuous circular stain in the middle covering a third to half its area, usually purple-black; *perianth tube* cylindrical, slender, 5—7 mm. long; *lobes* connate for 1 mm. or less, equal, oblong or obovate-oblong, obtuse, usually shortly unguiculate or subunguiculate, 1·5—2 cm. long, 0·7—1·2 cm. wide. *Stamens* arising at top of perianth tube, the filaments about 5 mm. long; anthers 6—8 mm. long, usually purple-black and somewhat conspicuous, occasionally paler. *Ovary* rotund, about 3 mm. long; style reaching to base of filaments, the branches linear or linear-oblanceolate, conduplicate, 4—5 mm. long, the upper half minutely ciliate.

HOLOTYPE. *Roux*, NBG 209/27 in the Bolus Herbarium.

Foot of mountains in the Piketberg and Tulbagh Divisions.

Flowering period. October—November.

PIKETBERG. Porterville, *Roux*, NBG 207/27, 209/27 (BOL, K); *Loubser* 854 (NBG).

TULBAGH. De Hoek Estates, Saron, *Thudichum* (BOL 26917); *Zeyher* (K).

WITHOUT LOCALITY. *Thunberg* (UPS—*I. maculata* sheet 6); *Drege* 8366 (S).

A striking character of this species is the way in which the short stiff branches spread at an angle of 45 to 90 degrees from the stem, with the short few-flowered spike curved up and erect. It is closely allied to *I. polystachya*, in which the same stiff type of branching occasionally occurs, but the more or less unguiculate lobes and large conspicuous dark stain generally serve to distinguish it.

22. **I. purpureorosea** Lewis sp. nov.

Cormus subglobosus, 1—1·4 cm. diam., tunicis membranaceis fuscis. *Caulis* subgracilis, simplex, 18—60 cm. altus. *Vaginae basales* 2, subacutae vel acutae, ad 10 cm. longae, interdum apicem versus virides. *Folia* 4—5, disticha, lanceolata, 15—40 cm. longa, 5—9 mm. lata, plerumque prope ad basin spicae attingentia, mollia, multi-nervata, nervo medio solum subprominente. *Spica* dense 3—12-flora, rachide flexuoso interdum declinato et plus minusve horizontali. *Bractea* oblonga, 7—9 mm. longa, cuspidata et lobis vel dentibus duobus instructa, pellucida, alba, interdum apicem versus minute brunneo-punctata; *bracteolae* bifidae bicarinatae cuspidatae. *Flores* purpureo-rosei, tubo et basi segmentorum purpureo-nigro; *perianthii tubus* e bractea exsertus, 0·8—1 cm. longus, gracilis cylindricus apicem versus leviter ampliatus; *segmenta* per circa 2 mm. connata, patentia, oblongo-ovata vel elliptica obtusa, 1·5—2 cm. longa, 7—9 mm. lata. *Stamina* ad apicem tubi perianthii orta, erecta, filamentis 3—4 mm. longis et antheris linearibus subsagittatis luteis 6—8 mm. longis. *Ovarium* rotundum, 3 mm. longum; stylus ad basin vel medium antherarum attingens, ramis albis recurvis linearibus conduplicatis 4—6 mm. longis apicem versus minute ciliatis.

Corm subglobose, 1—1·4 cm. diam.; tunics membranous, dark brown. *Stem* fairly slender, simple, 18—60 cm. high. *Basal sheaths* 2, subacute or acute, up to 10 cm. long, sometimes green at the apex. *Leaves* 4—5, distichous, lanceolate, 15—40 cm. long, 5—9 mm. wide, usually reaching nearly to base of spike, soft in texture, several-veined, with only the midrib slightly prominent. *Spike* closely 3—12-flowered, the rachis flexuose, sometimes declinate and more or less horizontal. *Bract* oblong, 7—9 mm. long, with a cusp and 2 lobes or teeth, pellucid, white, sometimes faintly and minutely spotted with brown at the apex; *bracteoles* bifid, bicarinate and cuspidate. *Flowers* mauve-pink, the tube and base of the lobes purple-black; *perianth tube* exserted from bract, 0·8—1 cm. long, slender, cylindrical, very slightly expanded to the throat; *lobes* connate for about 2 mm., patent, oblong-ovate or elliptic, obtuse, 1·5—2 cm. long, 7—9 mm. wide. *Stamens* arising at top of perianth tube, erect, the filaments 3—4 mm. long; anthers linear, subsagittate, 6—8 mm. long, yellow. *Ovary* rotund, 3 mm. long; style reaching to base or middle of anthers, the branches whitish, recurved, linear, conduplicate, 4—6 mm. long, minutely ciliate towards the apex.

HOLOTYPE. *Lewis* 5243 in the Compton Herbarium, Kirstenbosch.

Local in sclerophyll vegetation on the peninsula west of the lagoon at Saldanha Bay.

Flowering period. September—October.

HOPEFIELD. Postberg, Saldanha Bay, *Lewis* 5243 (NBG); *Pillans* 6962 (BOL); *Maguire* 444 (NBG) and *Lewis* (SAM 60709) from Darling Flower Show.

WITHOUT LOCALITY. *Van Royen* 103 (L); *Thunberg* (S).

This species, with its slightly funnel-shaped perianth tube, is almost intermediate between the sections *Ixia* and *Morphixia* but its affinity is with the former. It has been confused with *I. conferta* but has much softer, membranous corm tunics, softer leaves, pale bracts and the flowers differ in having the perianth tube very slightly expanded to the throat, narrower lobes which are widest at or below the middle, and the style and style branches longer. It has a very limited distribution and is only recorded from the peninsula west of the lagoon at Saldanha Bay.

The plant figured by Andrew as *I. maculata* var. *minor* in the Bot. Rep., t. 256 (1802), is possibly this species.

23. **I. campanulata** Houtt. Handl. 12: 42. t. 78. f. 4. 1780; Panzer, Pflanzensyst. 11: 49. t. 78. f. 4. 1784; N. E. Br., Kew Bull. 1929, 133; Merrill, Journ. Arn. Arb. 19: 327. 1938. *I. campanulata* Banks ex Roem. & Schultes, Syst. 1: 391. 1817. *I. aristata* Thunb. Diss. Ixia 14. 1783; non Ker 1802 nec Baker 1896. *I. leucantha* Jacq. var. *aristata* (Thunb.) Baker, Fl. Cap. 6: 79. 1896. *I. concolor* Salisb. Prodr. 36. 1796. *I. anemonaeflora* Jacq. Ic. t. 273. 1786—93 et Coll. Suppl. 10. 1796; Baker, Journ. Linn. Soc. Bot. 16: 91. 1877; Dur. & Schinz, Consp. Fl. Afr. 5: 182. 1895; non Red. 1805. *Sparaxis anemonaeflora* Ker in Koenig & Sims Ann. Bot. 1: 225. 1805. *Geissorrhiza anemonaeflora* Klatt, Linnea 34: 357. 1866, pro parte. *Ixia speciosa* Andr. Bot. Rep. 3: t. 186. 1802; Willd. Enum. 1: 56. 1809; Baker, Fl. Cap. 6: 80. *I. crateroides* Ker, Bot. Mag. t. 594. 1802. *I. coccinea* Thunb. Fl. Cap. 241. 1811, pro parte. *Gladiolus coccineus* Schrank, Denkschr. Bot. Ges. Regensb. 2: 197. 1822. *Ixia pulcherrima* Eckl. Top. Verz. 24. 1827, pro parte, *nomen nud. I. candida* Eckl. l. c. 27; non Del. 1814.

Corm ovoid or irregularly subglobose, 1—1·8 cm. diam.; tunics of fine reticulate fibres extending up in a neck 1—2 cm. long. *Stem* 10—35 cm. long, simple, rarely with a long branch arising near the base, straight or flexuose, sometimes curved shortly above the base or near the middle and the upper part subdeclinate. *Leaves* 5—10, linear or subulate, 5—20 cm. long, 2—5 mm. wide, erect or suberect, usually half as long as the stem or slightly more, 3—6-nerved (occasionally 9), the mid-rib and margins slightly prominent. *Spike* short, closely 1—9-flowered, usually 3—6. *Bract* suborbicular, 4—6 mm. long, 5—7 mm. wide, tricuspidate, rarely subtruncate with a single cusp, usually fairly conspicuously 3-nerved and often with several very fine veins, whitish or occasionally magenta-pink; *bracteoles* bicarinate, bicuspidate. *Flowers* rotate-campanulate or crateriform with a very short tube, varying from deep crimson to pure white, usually red with a longitudinal white band on the outside of the lobes or white suffused with red outside; *perianth tube* filiform, 2—3 mm. long, more or less included in the bract; *lobes* connate for 1—2 mm., obovate or obovate-oblong, 1·2—2·5 cm. long, 0·8—1·2 cm. wide. *Stamens* arising at throat of perianth tube, the filaments 3—5 mm. long; anthers linear, 6—8 mm. long. *Ovary* subglobose, 2·5—4 mm. long; style reaching to middle or top of anthers or shortly above them, the branches 3—4 mm. long, linear, conduplicate, minutely ciliate.

HOLOTYPE. *Burmann* in Herb. Delessert, Geneva.

Sandy places at the foot of mountains in the Tulbagh, Paarl and Worcester Divisions...

Flowering period. October—November.

TULBAGH. Near Tulbagh, *Ecklon* 432 (*I. pulcherrima* Eckl.; G, K, M, PRE, S); *Ecklon* 444 (*I. candida* Eckl.; G, K, M, PRE, S); Tulbagh Waterfall, *Ecklon* and *Zeyher* 75 (K); near Tulbagh, *MacOwan* 2480 (K); *Zeyher* (SAM 20912); *Thom* (K); *Pappe* (BM); foot of Winterhoek, *MacOwan* HNAA 265 (BM, BOL, G, K, SAM, UPS); *Wall* (S); foot of Saronberg, *Thudichum*, NBG 2261/36 (BOL, NBG); Saron, *Lewis* (BOL)

WORCESTER. Between Darling Bridge and Worcester, *Bolus* (BOL 26892); Slangheuvel, *Drege* 1558 (P); between Slangheuvel, French Hoek and Donkerhoek, *Drege* (K, S); near Bothashalt Station, *van Breda* 1027 (NBG, PRE); Worcester district, *Cooper* 1671 (K), 1694 (BOL, K, PRE Z).

PAARL. French Hoek Kloof, *Drege* (K).

WITHOUT LOCALITY. *Burmann* (G—type of *I. campanulata*, also plant named *I. flexuosa alba*); *Drege* (BM, G, L); *Lamarck* (P); *Ecklon* and *Zeyher* 266 (G); *Leibold* (G); *Ecklon* and *Zeyher* 82 (G, S); *Martin* (G); *Niven* (BR, G); *Roxburgh* (BM, G); *Thunberg* (UPS—*I. aristata* sheets a, b and c); *Thunberg* (UPS—*I. coccinea* sheet a, also S); *Brehm* (BR, M—*Gladiolus coccineus* Schrank); *Verreaux* (G).

The species is variable as regards the size of the plant, the number of flowers and their colour which varies from deep crimson to pure white with intermediates such as crimson longitudinally banded with white on the outside or white flushed with red on the outside. A few of the forms were considered to belong to different species and some were even placed in other genera. One example of a series of misidentifications concerns the plant with a single large white flower illustrated by Jacquin in his Icones, t. 273, as *I. anemonaeflora.* Ker did not recognise this as an *Ixia* and in 1805 transferred it to the genus *Sparaxis*, probably taking it to be the same as *I. anemonaeflora* Red. Lil. t. 85 (1804), which is a species of *Sparaxis.* In 1866 Klatt transferred *I. anemonaeflora* Jacq. to the genus *Geissorrhiza*, but in 1896 Baker replaced it in *Ixia.* He referred to it in a note under *I. leucantha* as "probably a garden form of this with one very large flower" (Fl. Cap. 6: 79). *I. leucantha* Jacq. is a form of *I. polystachya* L., but two of the collections cited under *I. leucantha* by Baker are in fact the white colour form of *I. campanulata*, i.e. *Ecklon* 444 from near Tulbagh and *Drege* from between Slangheuvel, Frenchhoek and Donkerhoek.

According to N. E. Brown, sheet *a* of *I. aristata* Thunb. is identical with Drege's collection from between Slangheuvel, Frenchhoek and Donkerhoek (Journ. Linn. Soc. Bot. 48: 43. 1928). Of the four sheets named *I. aristata* in Thunberg's Herbarium, Dr. Brown selected the first as the type of *I. aristata*, and considered that each of the others contained a different species. The second he named *I. elegans* (= *Wuerthia elegans* Regel), a new status for *I. aristata* var. *elegans* (Regel) Baker. The third he left unnamed, stating that it did not match any collection in Kew Herbarium, and the fourth was identified by him as *I. micrandra* Baker. The last is correct but I do not agree about the other three and consider that they are all forms of *I. campanulata*, the first a dwarf form, 6—7 inches high with one or two smallish flowers to a plant, the second taller and more robust with a few larger white and red flowers, and the third the same but slightly taller, about two feet high. When I examined Thunberg's specimens in 1949 I noted that at the foot of sheet *a* was written "*campanulata* Houtt.", probably by Linnaeus f. but I cannot be certain about this. Baker, in his Handbook of the Iridaceae and the Flora Capensis, placed *I. aristata* Thunb. as a variety of *I. leucantha* Jacq., and used the name *I. aristata* Ker for a very different species (renamed *I. longituba* by N. E. Brown) which Ker had taken to be the same as Thunberg's.

In Thunberg's Herbarium there are two sheets named by him *I. coccinea*, the first of which is the red colour-form of *I. campanulata* and contains two plants, one only a few inches high, with two flowers, and the other taller with four flowers. The second sheet was correctly identified as *I. patens* Ait. by N. E. Brown.

I. campanulata was figured in 1802 in the Botanical Magazine, t. 594, where it was named *I. crateroides* by Ker, who gave as synonyms *I. speciosa* Andr. and *I. campanulata* Herb. Banks. The following extracts from Ker's description of this species are of interest. The corm he described as being "of a more succulent spongy substance, and not as farinaceous as usual in the genus," and the flowers "of a more substantial consistence than in most species". He added that "out of many hundred specimens both indigenous and from gardens, this is the only one we have ever seen with so many as three flowers, though the species is as liable as its congeners to vary in size of leaf and height of stem".

24. **I. metelerkampiae** L. Bolus, S. Afr. Gard. 19: 27. 1929.

Corm subglobose, 1—2 cm. diam.; tunics somewhat matted, of fine pale reticulate fibres extending up in a neck 2·5—7 cm. long. *Stem* 35—75 cm. high, straight or flexuose, simple or usually divaricately or subdivaricately branched with 1—2 fairly long branches sometimes reaching to about the same level as the terminal spike. *Leaves* 5—9, linear or linear-lanceolate, 10—30 cm. long (average 15—25 cm.), 1—6 mm. wide, usually erect or suberect and reaching to about the middle of the stem, sometimes nearly to the top. *Spike* 5—15-flowered, short and compact but elongating as the flowers mature and finally fairly long and lax with a flexuose rachis. *Bract* suborbicular, truncate or obtuse with a single short cusp or tooth or shortly tridentate, 4—5 mm. long, colourless, pellucid; *bracteoles* bicarinate, bidentate. *Flowers* subrotate-campanulate with a very short tube, pale pink, mauve-pink, bluish mauve or purplish lilac, with a very small purplish red irregular star outlined in white at the centre and a small purplish red spot tapering upwards near the base of each lobe; *perianth tube* filiform, 3—4 mm. long; *lobes* connate for 1—2 mm., equal, obovate or obovate-oblong, 1·4—2·2 cm. long, 0·6—1·2 cm. wide. *Stamens* arising at throat of perianth tube; filaments 4—5 mm. long; anthers 5—6 mm. long, linear, subsagittate. *Ovary* globose or obovoid, 2·5—4 mm. long; style reaching to top of filaments or slightly above, the branches 3—4 mm. long, linear, conduplicate, very slightly expanded and minutely ciliate near the apex.

HOLOTYPE. *Meterlerkamp*, NBG 1707/26 in the Bolus Herbarium.

Lower slopes of mountains in the Paarl, Wellington and Worcester Divisions.

Flowering period. November—December.

WORCESTER. Bains Kloof, *Lewis* 5678 (NBG); *Linley* (SAM 59776); *Schlechter* 9113 (BM, G, K, PRE, Z); Du Toits Kloof, *Barker* 7161 (NBG); *Esterhuysen* 12315 (BOL, PRE), 17766 (PRE); Worcester district, *Cooper* 1611 (K), 1682 (BM, K).

PAARL. Kloof on Suurvlakte, Hawequas Mt., 2,000—3,000 ft., *Esterhuysen* 12315 (BOL, NBG, SAM); near top of Du Toits Kloof, *Lewis* 2288 (SAM); Du Toits Kloof, 2,000—2,500 ft., *Drege* 8368 (G, P), 8376 b (P).

WELLINGTON. *Joubert*, NBG 2632/29 (BOL); Bains Kloof, *Metelerkamp*, NBG 1707/26 (BOL, K); *Grant* 2643 (BOL, PRE); *Worsdell* (K).

WITHOUT LOCALITY. *Drege* 8369 (BM, K, L).

I. metelerkampiae is very closely allied to *I. campanulata* from which it differs in having a longer stem, sometimes more or less divaricately branched, and colourless bracts with inconspicuous cusps and the flowers with different colouring and markings. The plants are often fairly sturdy with the stem somewhat stouter and less flexible than is usual in the genus, and the branches when present are comparatively long, usually reaching to about the same level as the terminal spike. Like most species, however, it is variable and some very slender forms have been seen.

25. **I. vinacea** Lewis sp. nov. *I. maculata* var. Jacq. Hort. Schoenbr· t. 20. 1797.

Cormus globosus, 1·7—2 cm. diam., tunicis e fibris subrobustis parallelis erectis confluentibus supra medium plus minusve connatis, in collo circa 3 cm. longo productis, compositis. *Caulis* gracilis, simplex, 40—45 cm. altus. *Vaginae basales* 2 vel 3. *Folia* 3, 2 inferiora linearia, erecta, firma, 45—60 cm. longa, 2—3 mm. lata, spicam paulo vel bene superantia, supremum brevius, vaginans, lamina libera brevi vel longa. *Spica* brevis, compacta, dense 3—9-flora. *Bractea* obovata vel oblongo-obovata, 5—8 mm. longa, obtusa vel subtruncata cuspe brevi instructa, interdum breviter tridentata, pallide brunneo-alba vel rosea, nervis pluribus leviter prominentibus; *bracteolae* bicarinatae bicuspidatae. *Flores* vinacei ad medium macula caeruleo-purpurea vel nigro-caerulea notati; *perianthii tubus* filiformis, 4—7 mm. longus; *segmenta* per 1 mm. vel minus connata, patentia vel subreflexa, oblonga obtusa, 1·7—2 cm. longa, 0·7—1 cm. lata, interdum basin versus gradatim angustata et subunguiculata. *Stamina* ad apicem tubi perianthii orta, erecta, filamentis purpureo-cyaneis 3·5 mm. longis et antheris fuscis linearibus 7 mm. longis. *Ovarium* rotundum, 3 mm. longum; stylus ad apicem tubi perianthii attingens, ramis linearibus conduplicatis 4 mm. longis, dimidia parte superiore minute ciliata.

Corm globose, 1·7—2 cm. diam.; tunics of fairly coarse vertical parallel fibres, confluent and more or less connate above the middle, extending up in a neck about 3 cm. long. *Stem* slender, simple, 40—45 cm. high. *Basal sheaths* 2 or 3, the lowest colourless, obtuse, enclosed in neck fibres, the second 5—7 cm. long, acute, purplish near the apex, the third 12—14 cm. long, green, acuminate. *Leaves* 3, the 2 lower linear, erect, firm, 45—60 cm. long, 2—3 mm. wide, reaching shortly or well above the spike; third leaf shorter, sheathing with a short or long free blade. *Spike* short, compact, closely 3—9-flowered. *Bract* obovate or oblong-obovate, 5—8 mm. long, obtuse or subtruncate with a short cusp, sometimes shortly tridentate, pale brownish white or pinkish, with several slightly prominent veins; *bracteoles* bicarinate, bicuspidate. *Flowers* wine-red with a bluish purple or blue-black circular stain in the middle; *perianth tube* filiform, 4—7 mm. long; *lobes* connate for 1 mm. or less, patent or slightly reflexed, oblong, obtuse, 1·7—2 cm. long, 0·7—1 cm. wide, sometimes tapering to the base and subunguiculate. *Stamens* arising at top of perianth tube, erect, the filaments dark purple-blue, 3·5 mm. long; anthers dark, linear, 7 mm. long. *Ovary* rotund, 3 mm. long; style reaching to top of perianth tube, the branches linear, conduplicate, 4 mm. long, the upper half minutely ciliate.

HOLOTYPE. *Lewis* 5742 in the Compton Herbarium, Kirstenbosch.

Flats in vicinity of Tulbagh, in clay and stony ground.

Flowering period. August—September.

TULBAGH. *De Klerk*, NBG 1472/22 (BOL); *Pillans* (BOL 18727); *Lewis* 5742 (NBG).

WITHOUT LOCALITY. *Thom* (K).

I. vinacea is distinguished from *I. dubia*, *I. polystachya* and allied species by the corm tunics, which extend up in a fibrous neck, and the fewer and comparatively longer linear leaves which extend above the inflorescence. In the dried state it somewhat resembles *I. gloriosa* but can be distinguished by its simple stem, longer leaves, more compact spike, shorter bracts and the colour of the flowers, also the perianth lobes which are connate for about 2 mm. in *I. gloriosa* and 1 mm. or less in *I. vinacea*.

The striking colour of the flowers makes this one of the most attractive species but it is not a good garden plant owing to the few flowers produced in a short spike, with no branches to prolong the flowering period. It was figured by Jacquin in 1797 as a variety of *I. maculata* and the plants described above match the right-hand figure on plate 20 of his Hortus Schoenbrunniensis. The plant figured on the left on the same plate appears to be either a form of this or a hybrid, with slightly shorter leaves not overtopping the spike, the flowers dark blue with a reddish band outside the deep purplish centre, the lobes narrowed to the base and unguiculate, and shorter style branches.

An unlocalised plant in Kew Herbarium, collected by Dr. Thom, mounted on a sheet with two specimens of *I. patens* var. *linearifolia*, matches the plants described above except that the anthers are yellow instead of dark, but as both yellow and dark anthers are known to occur in other species no great importance is attached to this.

26. **I. gloriosa** Lewis sp. nov.

Cormus ovoideus, 1—1·3 cm. diam., tunicis e fibris tenuibus pallide brunneis reticulatis compositis. *Caulis* gracilis, 35—65 cm. altus, simplex vel ramis 1—3 erectis gracillimis. *Vaginae basales* 2, 3—13 cm. longae. *Folia* 3—4, 2 vel 3 inferiora linearia erecta, 15—55 cm. longa, 1—3 mm. lata, ad medium caulis vel ulterius attingentia, marginibus et nervo medio subprominentibus, supremum vaginans lamina libera brevi vel longa. *Spica* sat laxe 4—10-flora, rachide subflexuoso. *Bractea* oblonga vel oblongo-ovata, 0·8—1 cm. longa, tricuspidata vel tridentata, pellucida, sine colore vel apicem versus minute brunneo-punctata, interdum nervis purpureis 3 vel 5; *bracteolae* 2-nervatae bicuspidatae. *Flores* sat grandes, rosei ad medium macula purpureo-nigra lucida notati; *perianthii tubus* filiformis, 3—6 mm. longus, in bractea inclusus vel leviter exsertus; *segmenta* per circa 2 mm. connata, basi campanulata, supra patentia, oblonga vel oblongo-ovata obtusa, 1·5—2 cm. longa, 0·7—1·2 cm. lata, subaequalia vel exteriora quam interiora 1—3 mm. latiora. *Stamina* ad apicem tubi perianthii orta, erecta, filamentis 4—5 mm. longis et antheris fuscis linearibus 6—7 mm. longis apicem versus cohaerentibus. *Ovarium* oblongum, 3—4 mm. longum; stylus ad basin vel medium filamentorum attingens, ramis falcatis linearibus conduplicatis 3—3·5 mm. longis, minute ciliatis.

Corm ovoid, 1—1·3 cm. diam.; tunics of fine pale brown reticulate fibres. *Stem* slender, 35—65 cm. high, simple or with 1—3 slender erect branches. *Basal sheaths* 2, 3—13 cm. long, the lower obtuse or acute and upper acute or acuminate. *Leaves* 3—4, the lower 2 or 3 linear, erect, 15—55 cm. long, 1—3 mm. wide, reaching to or above middle of stem, with fairly prominent margins and midrib; upper leaf sheathing with a short or fairly long free blade. *Spike* somewhat laxly 4—10-flowered, the rachis slightly flexuose. *Bract* oblong or oblong-ovate, 0·8—1 cm. long, tricuspidate or tridentate, pellucid, more or less colourless or sometimes minutely brown-spotted at the apex, sometimes with 3 or 5 purplish veins; *bracteoles* 2-veined, bicuspidate. *Flowers* fairly large, deep pink with a shining purple-black circular stain in the middle; *perianth tube* filiform, 3—6 mm. long, included in the bract or very shortly exserted; *lobes* connate for about 2 mm., campanulate at the base, patent above, oblong or oblong-ovate, obtuse, 1·5—2 cm. long, 0·7—1·2 cm. wide, subequal or the outer 1—3 mm. wider than inner. *Stamens* arising at top of perianth tube, erect, the filaments 4—5 mm. long; anthers dark, linear, 6—7 mm. long, connivent at the apex. *Ovary* oblong, 3—4 mm. long; style reaching to base or top of filaments, the branches falcate, linear, conduplicate, 3—3·5 mm. long, minutely ciliate.

HOLOTYPE. *Esterhuysen* 24556 in the Bolus Herbarium.

Low slopes of mountains in the Montagu Division.

Flowering period. August—September.

MONTAGU. Foot of Langeberg near Leeurivierberg, *Esterhuysen*

24556 (BOL); Scheepersrust, 20 miles E. of Montagu, *Martley* (BOL 26930).

This striking and beautiful species resembles *I. conferta* but has much finer corm tunics, fewer and narrower leaves, the stem usually taller and branched with a laxer spike, paler bracts, and the flowers have a shorter tube. The dark stain in the centre of the flower shines as if waxed.

27. **I. vanzijliae** L. Bolus, Ann. Bol. Herb. 4: 114. 1927.

Corm ovoid, 0·8—1·5 cm. diam.; tunics of fine reticulate fibres. *Stem* 18—40 cm. high, slender, simple or with 1 short erect branch near the top. *Basal sheaths* 2—3, 1·5—6 cm. long, the upper half ferruginous, with more or less undulate margins. *Leaves* 5, the 3 basal much shorter than the stem, 4—16 cm. long, 0·4—1·2 cm. wide, somewhat coriaceous, suberect, lanceolate, spirally twisted, with undulate margins; cauline leaves much longer than the basal, up to 25 cm. long, sheathing. *Spike* short, closely 2—7-flowered. *Bract* ovate-lanceolate, 0·9—1·3 cm. long, acute or tridentate, the apex soon becoming torn, the upper half or sometimes the whole closely flecked with fine brown lines; *bracteoles* slightly shorter than bract, bicuspidate. *Flowers* pinkish or pinkish mauve with a small darker mauve circular stain in the middle; *perianth tube* filiform, straight or curved, 0·8—1 cm. long; *lobes* connate for 1—2 mm., obovate-oblong, obtuse, 1·3—2 cm. long, 0·8—1·1 cm. wide. *Stamens* arising at throat of perianth tube; filaments about 3 mm. long; anthers 6—7 mm. long, linear, subsagittate. *Ovary* rotund, 3 mm. long; style reaching to middle of anthers, the branches linear, conduplicate, 2·5 mm. long, minutely ciliate near the apex.

HOLOTYPE. *Van Zijl* in the Bolus Herbarium (No. 18537).

Broken karoo veld in the Swellendam Division.

Flowering period. August—September.

SWELLENDAM. Bonnievale, *Hurling* and *Neil* in Herb. Marloth No. 13709 (BOL, K, PRE).

WITHOUT LOCALITY. *Van Zijl* (BOL 18537); *Ashton* (BOL 17657).

The leaves, with their undulate margins, distinguish this species from all others in the section. It appears to be rare and is known only from the three collections cited above. It was originally described from plants grown in a garden at Claremont, Cape Peninsula, said to have come from the Clanwilliam district, but this must be a mistake as it is fairly certain that this species occurs only in the northern karroid parts of the Swellendam Division.

28. **I. dubia** Vent. Choix. t. 10. 1803; DC. in Red. Lil. t. 64. 1804; Dur. & Schinz, Consp. Fl. Afr. 5: 183. 1895. *I. angustifolia* Eckl. Top. Verz. 25. 1827, *nomen nud.* *I. maculata* sensu Baker, Handbk. Irid. 163.

1892 et Fl. Cap. 6: 81. 1896, pro parte; Marloth, Fl. S. Afr. 4: 145. t. 42 d. 1915; Lewis in Adamson & Salter Fl. Cap. Pen. 248. 1950; non L. 1762. *Gladiolus umbellatus* Schrank, Denksch. Bot. Ges. Regensb. 2: 202. 1822.

Corm subglobose, 1—1·7 cm. diam.; tunics of moderately firm dark reticulate fibres. *Stem* 20—75 cm. high, usually 30—50 cm., simple or with 1—2 short branches. *Basal sheaths* 2 or 3, 1—8 cm. long. *Leaves* 5—7, linear or linear-lanceolate, 10—50 cm. long, 1·5—8 mm. wide, usually reaching to middle of stem or shortly above but sometimes longer, fairly firm, 3—8-veined with the mid-rib and sometimes also the margins slightly prominent. *Spike* short, capitate, closely 3—15-flowered, the bracts imbricate. *Bract* ovate or ovate-oblong, 5—9 mm. long, carinate, acute or subobtuse with a short cusp, shortly tricuspidate or with a short cusp and 2 short lobes or teeth, pellucid, colourless or pinkish, often striate with several slightly prominent pale veins; *bracteoles* bicarinate, bicuspidate. *Flowers* orange or deep golden-yellow generally with a small dark brown or purplish circular stain in the middle, the outer lobes usually more or less reddish below; *perianth tube* cylindrical, often filiform, 0·6—1·4 cm. long, usually 0·6—1 cm.; *lobes* connate for 1—1·5 mm., oblong or ovate-oblong, obtuse, 1·5—2·2 cm. long, 0·6—1·2 cm. wide. *Stamens* arising at top of perianth tube, the filaments nearly always free but occasionally connate at the base, 3—5 mm. long; anthers linear, 6—8 mm. long, subsagittate. *Ovary* rotund, about 3 mm. long; style usually reaching to middle or top of filaments, the branches linear or oblanceolate, conduplicate, 3—5 mm. long, the upper half minutely ciliate.

LECTOTYPE. Vent. Choix t. 10.

Fairly common on sandy flats, hills, mountain slopes and plateaux up to 3,000 ft. alt., on the Cape Peninsula and in neighbouring districts.

Flowering period. October—December.

PIKETBERG. Bottom of Versvelds Pass, *Pillans* 7126 (BOL).

TULBAGH. *Pappe* (SAM); *Ecklon* 435 (K, M, S); *du Toit*, NBG 939/60 (NBG).

BELLVILLE. Melkbosstrand road, *Barker* 1564 (NBG); between Philadelphia and Melkbosstrand, *Wasserfall* 1016 (PRE); Stikland, *Wall* (S).

CAPE. Doornhoogde, *Zeyher* 1600 (BM, BOL, G, K, PRE, SAM, Z); Cape Flats, *Ecklon* and *Zeyher* 224 (K, SAM), 439 (SAM); Karbonkelberg, *Compton* 15381 (NBG); *Leighton* 312 (BOL); above Bakoven, *Barker* 3216 (BOL, NBG); Camps Bay, *Zeyher* 5037 (BOL, K, PRE), 5036, 5040 (PRE); *Barker* 3199 (NBG); *Lewis* 954 (SAM); *Galpin* 4687 (PRE); *Cassidy* 42 (NBG); between Kloof Nek and Camps Bay, *Lewis* 953 (SAM); Table Mt. near Kasteelpoort, *MacOwan* HNAA 263 (BM, BOL, G, K, SAM, UPS); foot of Table Mt., *MacOwan* 2277 (G, K); *Rogers* 17804 (K);

Mudd 25 (K); *Ecklon* 436 (K, PRE, S, Z—*I. angustifolia* Eckl.); near Cape Town, *Marloth* 344 (PRE); Grootkop, 2,500 ft., *Compton* 19416 (NBG); flats near Rondebosch, *Dod* 382 (BOL, K); *Bolus* 3329 (BOL, Z); *Burchell* 184 (K); Bergvliet, Wynberg and Cape Flats, *Bowie* (BM); Wynberg, *Bolus* 4685 (PRE); *Wallich* (BM): Bergvliet, *Ecklon* and *Zeyher* 86 (SAM); between Constantiaberg and Vlakkenberg, *Salter* 2915 (BOL, K); Steenberg, *Bodkin* 1943 (BM, K); Muizenberg, *Lansdell* (PRE); Muizenberg Mt., near Kalk Bay, *Bolus* 3329 (BM, BOL, K); Chapmans Peak, *Compton* 15442 (NBG): *Lewis* 476, 952 (SAM): Noordhoek, *Barker* 3271 (NBG); Fish Hoek Mt., *Bolus* 7006 (BOL): *Werdermann* and *Oberdieck* 795 (B, PRE); Simonstown, *Salter* 332 11 (BM): *Wall* (S): *MacGillivray* 474 (K); *Prior* (K); *Wright* (K, L); *Meebold* 14897 (M); Schusterskraal, *Compton* 17479 (NBG); Olifantsbosch, *Compton* 23708 (NBG); Klaasjagersberg, *Compton* 17574 (NBG); Brightwater, *Barker* 7174 (NBG).

WELLINGTON. Bains Kloof, *Worsdell* (K).

PAARL. Du Toits Kloof, *Pillans* 8466 (BOL); French Hoek, *Meebold* 14894 (M); *Thode* A 2222 (PRE).

STELLENBOSCH. Mountain slopes, *Garside* 1062 (K): *Worsdell* (K); Jonkershoek, *Garside* 77 (K); Banhoek, *Stanford* (BOL); Blaauklip, *Gillett* 1810 (BOL).

SOMERSET WEST. Sir Lowrys Pass, *Rogers* 26635 (PRE, Z); *Meebold* 14895 (M): slopes of Helderberg, *Pillans* 1232 (BOL): Vergelegen, *Lewis* 5674 (NBG); Gordons Bay, *Werdermann* and *Oberdieck* 133 (B, PRE).

CALEDON. Hermanus, *Rogers* 26506 (PRE, Z): Swartberg, near Baths, *Ecklon* and *Zeyher* (S); Bettys Bay, *Tijmens* (NBG).

WITHOUT LOCALITY. *Ecklon* and *Zeyher* 86 (G, named *I. angustifolia* Eckl.), 88 (B, SAM), 276 (G, S): *Bowie* 388 (G): *Marloth* 8485 (PRE); *Oldenburg* 705 (BM); *Thom* (K); *Forster* (K); *Prior* (BM); *Thunberg* (G); *Royen* (L); *Drege* 8354, 9581 a, b (P); *Jussieu* 3617, partly (P); *Percheron* 88 in Herb. Lamarck (P); *Martin* in Herb. Lamarck 679 (P); *Ecklon* 434 (M, S—*I. flava* Eckl.); *Harvey* 912 (K); *Brehm* (M—*Gladiolus umbellatus* Schrank); *Brehm* 151 (M—*Gladiolus luteus* Schrank).

As the plant from which Ventenat's illustration was drawn has not been seen, and it is not known if it was preserved, his figure is selected as the lectotype.

A form from the foot of the Hottentots Holland Mountains in the Somerset West Division differs from the common form described above in having firmer and more rigid leaves with narrow cartilaginous margins. Its flowers are a deep golden yellow, usually with a small brown stain in the middle and the outer lobes reddish brown outside, the perianth tube is 1—1·5 cm. long and the style reaches to the top of the tube, with branches 4 to 7 mm. long.

I. dubia has generally been confused with *I. maculata* and the majority of specimens in herbaria have been identified as the latter, while some of the descriptions published under the latter name apply partly or entirely to *I. dubia*. The confusion is due to the similarity in the colouring and appearance of the flowers but, as was pointed out by Ventenat when he described the species in 1803, the bracts and bracteoles are different and these, as well as other characters, serve to distinguish the species. The bracts of *I. maculata* are comparatively large, rusty reddish brown in colour and of a papery texture, at least in the upper half, and they tend to shrivel and become torn at the apex, whereas those of *I. dubia* are smaller, firmer in texture, pellucid and colourless or pinkish, usually striate with several slightly prominent pale veins, and they remain unchanged in size or shape into the fruiting stage. The corm tunics of *I. maculata* are usually soft, greyish and submembranous, and slender stolons bearing a cormlet at the apex often arise from the base of the corm; in *I. dubia* the tunics are composed of moderately firm dark reticulate fibres and no stolons have ever been observed. The filaments of *I. maculata* are almost always connate at the base, occasionally to the middle, or in var. *intermedia* to the middle or sometimes to the top, but in *I. dubia*, although they are closely placed and usually connivent at the base, they are rarely connate.

Two specimens of *I. dubia* in Kew Herbarium, collected by Dr. Thom, were compared with Thunberg's specimens of *I. erecta* by Dr. N. E. Brown who observed that they matched Thunberg's plants except that their leaves are not so broad. Thunberg described the flowers as immaculate but one of Dr. Thom's plants has flowers with a dark mark in the centre, though as far as can be seen there is none in the other. The identity of Thunberg's *I. erecta* is discussed in a note under *I. odorata* Ker.

In the Botanische Staatssammlung, Munich, a plant of *I. dubia* collected by Brehm is named *Gladiolus umbellatus* Schrank, and as the plant agrees with Schrank's description the name has been cited above as a synonym of *I. dubia*.

The type of *I. bicolorata* Klatt is no longer in the Berlin—Dahlem Herbarium and is presumed to have been destroyed during the last war. From the description it is possible that it was a small form of *I. dubia* (stem 6 to 12 inches), though there is no mention of a dark mark in the middle of the perianth such as is usually present in this species. In the Flora Capensis Baker reduced *I. bicolorata* to a variety of *I. polystachya* but he did not see the type and did not cite any other collections.

29. **I. maculata** L. (Fig. 4), Sp. Pl. ed. 2, 2: 1664. 1763 et Mant. 2: 320. 1771; Burm. f. Prod. Fl. Cap. 1. 1768, pro parte; Thunb. Diss. Ixia 16.

1783, pro parte; Ait. Hort. Kew. 1: 60. 1789; Baker, Handbk. Irid. 163. 1892 et Fl. Cap. 6: 81. 1896, pro parte; Dur. & Schinz, Consp. Fl. Afr. 5: 184. 1895; Pole Evans, Fl. Pl. S. Afr. 9. t. 329. 1929. *I. milleri* Berg. Pl. Cap. 8. 1767. *I. abbreviata* Houtt. Nat. Hist. 12: 41. t. 78. f. 3. 1780; Panzer, Pflanzensyst. 11: 48. t. 78. f. 3. 1784. *I. conica* Salisb. Prod. 36. 1796; Sims, Bot. Mag. t. 539. 1801; Red. Lil. t. 138. 1807. *I. capitata* Andr. Bot. Rep. t. 50. 1797. *I. duckittiae* L. Bolus, S. Afr. Gard. 21: 281—2. 1931.

Corm globose, 1—1·8 cm. diam.; tunics of soft greyish submembranous reticulate fibres; 1 or 2 slender stolons terminating in a cormlet sometimes arise at the base of the corm. *Stem* 18—50 cm. high, simple. *Basal sheaths* 2, 1—4 cm. long, the lower colourless, obtuse or acute, the upper one half green, acute. *Leaves* 5—8, subulate, linear or lanceolate, 10—35 cm. long, 2—7 mm. wide (occasionally up to 1·2 cm.), reaching to or above the middle of the stem, erect, suberect or the 2—3 basal sometimes more or less patent, moderately firm with several fine veins, usually spirally twisted. *Spike* short, capitate, closely 4—many-flowered, the rachis flexuose. *Bract* ovate or oblong, 0·8—1·5 cm. long, acute or cuspidate, sometimes with 2 short teeth and a cusp, ferruginous and densely streaked all over with fine reddish brown lines or occasionally pale at the base, papyraceous, generally somewhat shrivelled and with the apex lacerated at time of flowering; *bracteoles* bicarinate, bicuspidate. *Flowers* fairly large, orange or yellow-orange with a dark brown, blackish or purplish circular stain at the centre nearly always variegated with a small yellow or orange star-like pattern in the middle, the outer lobes usually more or less red on the outside; *perianth tube* cylindrical, sometimes filiform, 5—8 mm. long, not or only shortly exserted from the bract; *lobes* connate for 1—2 mm., patent, subequal, oblong, obtuse or subacute, 1·5—3 cm. long, 0·8—1·2 cm. wide. *Stamens* arising at throat of perianth tube, the filaments 3—5 mm. long, nearly always connate at the base, occasionally nearly to the middle; anthers linear, 7—9 mm. long, subsagittate. diverging above the middle. *Ovary* obovoid or globose, 3—4 mm. long; style reaching from shortly above base to middle of anthers, the branches 3—5 mm. long, linear or sometimes a little expanded towards the apex and subspathulate, conduplicate, falcate, the upper quarter or third minutely ciliate.

Lectotype. Sheet 58·21 in the Linnaean Herbarium.

Sandy flats and hills.

Flowering period. September—October.

CLANWILLIAM. *MacOwan* 2235 (K).

HOPEFIELD. Langebaan, *Lewis*, NBG 2037/32 (BOL, K).

MALMESBURY. Road to Gansekraal, *Kies* 135 (NBG); Darling

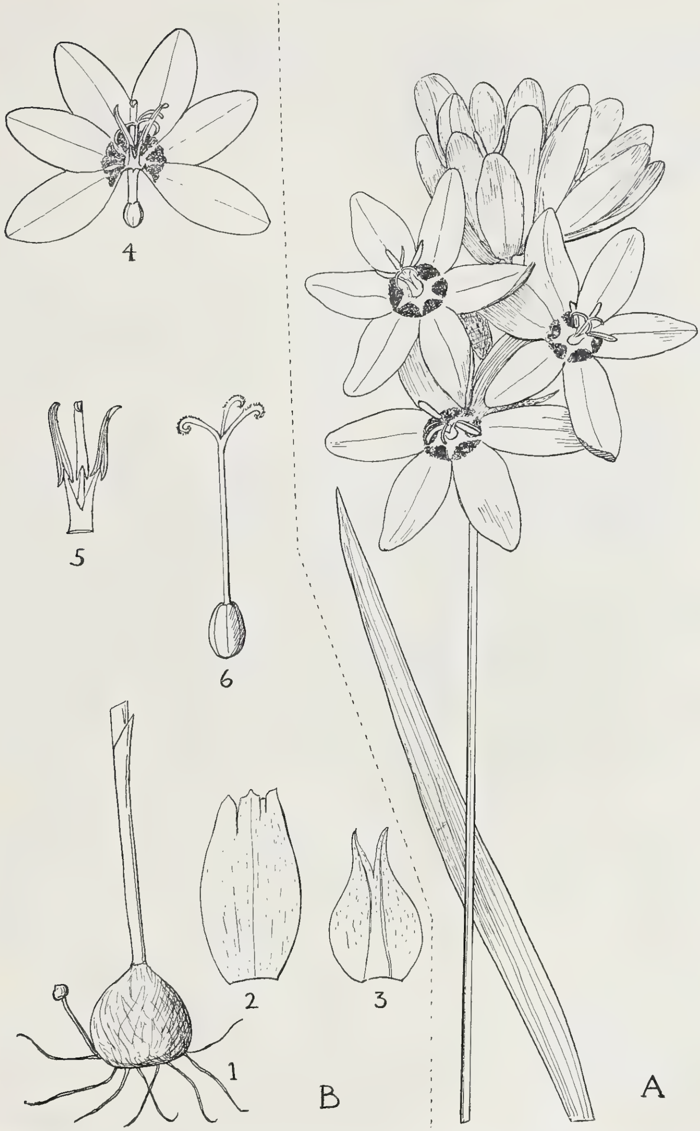


Fig. 4.—*I. maculata*. A. Copied from Bot. Mag. t. 539 (*I. conica* Salisb). B. *Lewis* No. 5746. 1. Corm and base of stem. 2. Bract × 2. 3. Bracteoles × 2. 4. Flower laid open. 5. Stamens × 2. 6. Gynaecium × 2. Del. G. J. Lewis.

Flora Reserve, *Barker* 8645 (NBG); *Lewis* 5746 (NBG); near Darling, *Bolus* (BOL 26919); *Duckitt*, NBG 3202/15 (BOL—type of *I. duckittiae*, K, NBG); *Lewis* 2244 (SAM); *Stokoe* (SAM 65870); near Malmesbury, *Schlechter* 1619 (Z); Groenekloof, *MacOwan* 2277 (SAM); *Zeyher* (PRE, SAM); *Ecklon* and *Zeyher* 265 (G, named *I. vitellina* Eckl.); Mamre hills, *Barker* 1565, 1766, 3837 (NBG).

BELLVILLE. Phesante Kraal, *Compton* 16018 (NBG); *Leighton* 648 (BOL).

CAPE. Near Cape Town, *Rutherford* 221 (BM); Rondebosch, *Drege* (K); *Dod* 373 (BM); Witteboom, *Drege* 311 (P).

WITHOUT LOCALITY. *Burmann* (G); *Linnaeus* (LINN—sheets 58·20 and 58·21); *Thunberg* (G and *I. maculata* sheet 8 in UPS); *Jussieu* 3617, partly (P); *Thom* (K); *Oldenburg* 88 (BM); *Drege* (BM, G, L); *Drege* 8355 (G); *Pappe* (K); *Villett* (K); *Cooper* 3610 (K); *Leibold* (G); *Ecklon* 269 (G, named *I. pallide flava* Eckl.).

The most noteworthy distinguishing characters of this species are the size and texture of the bracts and bracteoles which are larger and more conspicuous than in the majority of species, a rusty reddish brown colour—sometimes pale or greyish at the base—and papery in texture. They tend to become torn at the apex and shrivel instead of retaining their form almost unchanged into the fruiting stage, as is usual in nearly all species of *Ixia*. Another character, of which no mention has previously been made in descriptions although it is shown in the plant figured as *I. conica* in the Botanical Magazine (t. 539), is that the filaments are almost always connate at the base, occasionally nearly to the middle. In living plants the brightly coloured orange flowers with a comparatively small dark brownish or purplish circular stain in the middle, nearly always variegated with a star-like yellow pattern at the base, also serve to distinguish this species.

Linnaeus first published the name *I. maculata* and a brief description of the species in 1763 in the appendix to the second edition of his Species Plantarum, where he indicated that Miller's "*Ixia foliis gladiatis glabris*", Ic. t. 156. f. 1 (1757), and Oldenland's "*Sisyrinchium majus afric. flore luteo macula notato*", both of which he had cited under *I. crocata* (= *Tritonia crocata* (L.) Ker) on p. 52 in the first volume of the same work, should be referred to *I. maculata*. There is no doubt that Miller's figure, in spite of its inaccuracies, represents this species. In the Linnaean Herbarium there are three sheets named *I. maculata*, 58.20, 58.21 and 58.22. On the third are mounted two *Geissorrhiza* plants which do not agree with the description of *Ixia maculata*, and this name was deleted by J. E. Smith. Each of the other two sheets contains a specimen of *I. maculata*, the first without any note on its origin but the second, a weaker plant, is marked

HU (= Horto Upsaliensis), and since Linnaeus must have seen this plant in the living state, and possibly drew his description of the flowers from it, it is selected as the lectotype.

In 1767 Bergius named the species *I. milleri*, citing Miller Ic. t. 156, f. 2, the last an error as it is clear from his description that it should have been fig. 1. During the next thirty years the species was renamed three times, viz. *I. abbreviata* Houtt. (1780), *I. conica* Salisb. (1796) and *I. capitata* Andr. (1797), and in 1931 it was again described as a new species by Dr. L. Bolus, who named it *I. duckittiae*.

Thunberg placed several different species as colour varieties of *I. maculata* and of the nine sheets so named in his herbarium, only three are this species or varieties of it. Jacquin followed Thunberg's conception of *I. maculata* and regarded as varieties various other species in which the flowers have a stain of darker or contrasting colour in the middle. In 1797 he illustrated a number of them in his Hortus Schoenbrunniensis, tt. 19—22, but none of those figured is a variety of *I. maculata*; some are varieties or colour forms of *I. polystachya* but the majority of the flowers figured on plates 21 and 22 are hybrids, a few obviously derived from *I. monadelpha.* Much of the ensuing confusion about the identity of *I. maculata* can be attributed to Thunberg and Jacquin.

In 1801 it was figured on plate 539 of the Botanical Magazine where Sims used Salisbury's name for the species, though he gave as synonyms *I. maculata* L., *I. milleri* Berg., *I. capitata* Andr., and cited Miller's figure. However, that he was in some doubt about the name is clear from the following remarks: "This appears to be a very common plant at the Cape, as every importation of bulbs from there contains a considerable proportion of it, and some arrivals have consisted of little else. Perhaps it may be the plant first described by Linnaeus in the Mantissa, by the name of *I. maculata*, but as that is said to differ from *I. erecta* (i.e. *I. polystachya* L.) only in having a stain at the basis of the corolla, we reserve this name for the species answering best to this description, especially as we cannot trace our plant in any of the thirty-eight varieties of *maculata* figured in Hortus Schoenbrunniensis, among which several distinct species appear to us to have been blended."

Later the name *I. maculata* was generally applied to the species named *I. dubia* by Ventenat in 1803, no doubt due to the similarity in the colouring of the flowers, though in *I. dubia* the dark circular stain in the middle of the flower has no yellow star-like pattern at its base, and it differs also in having smaller bracts and bracteoles of a different colour and texture, and the filaments almost always free.

I. maculata no longer occurs on the Cape Peninsula, though it appears from some of the early records that it must at one time have done so.

Until the beginning of this century it must have been fairly widespread but it is now almost entirely confined to small areas in the Malmesbury Division.

Var. **intermedia** Lewis var. nov. *I. monadelpha* sensu Pole Evans, Fl. Pl. S. Afr. 8: t. 317. 1928; non De la R. 1768.

Var. *maculatae* similis sed ita differt. Bracteae minores obtusiores pallidae vel bicolores: flores plus minusve crateriformes, lobis concavis obtusioribus; filamenta ad medium vel raro ad apicem connata.

Cormus var. *maculatae* similis sed tunicis interdum e fibris subrobustis erectis confluentibus compositis. *Caulis* interdum ad 70 cm. altus, plerumque 20—40 cm. *Folia* var. *maculatae* similia sed plerumque latiora, 0·4—1·4 cm. lata. *Bractea* ovata vel oblongo-ovata, 0·7—1 cm. longa, obtusa, truncata vel interdum acuta vel breviter tridentata, alba vel conspicue bicoloris parte dimidia inferiore alba superne ferruginea, supra medium papyracea. *Flores* plus minusve late crateriformi, aurantiaci vel luteo-aurantiaci ad medium macula brunnea vel purpurea notati, segmentis exterioribus saepe extrinsecus rubidis; *perianthii tubus* 6—8 mm. longus, e bractea non vel breviter exsertus; *segmenta* per 1—2 mm. connata, obovata vel oblonga, obtusa, saepe leviter concava, 1·5—3 cm. longa, 0·9—2 cm. lata. *Filamenta* 4—6 mm. longa, ad medium vel raro ad apicem connata; antherae 0·8—1 cm. longae, diversae vel suberectae. *Gynaecium* var. *maculatae* simile.

Differs from var. *maculata* in having slightly smaller and more obtuse pale or conspicuously bicoloured bracts, the flowers more or less broadly crateriform with wider, more obtuse and concave lobes, and the filaments connate to the middle or occasionally to the top.

Corm as in var. *maculata* but the tunics sometimes of fairly firm vertical confluent fibres. *Stem* sometimes up to 70 cm. high, usually 20—40 cm. *Leaves* as in var. *maculata* but usually wider, 0·4—1·4 cm. wide. *Bract* ovate or oblong-ovate, 0·7—1 cm. long, obtuse, truncate or occasionally acute or shortly tridentate, whitish or conspicuously bicoloured with the lower half whitish and upper ferruginous, papyraceous above the middle. *Flowers* more or less broadly crateriform, orange or yellowish orange with a dark brown or purplish circular stain in the middle, the outer lobes often reddish outside; *perianth tube* 6—8 mm. long, not or only shortly exserted from the bract; *lobes* connate for 1—2 mm., obovate or oblong, obtuse, often slightly concave, 1·5—3 cm. long, 0·9—2 cm. wide. *Filaments* 4—6 mm. long, connate to the middle or occasionally to the top; anthers 0·8—1 cm. long, diverging or suberect. *Gynaecium* as in var. *maculata*.

HOLOTYPE. *Barker* 2591 in the Compton Herbarium, Kirstenbosch.

Sandy soil on flats, hills and mountain slopes in the coastal districts from Vanrhynsdorp to Hopefield.

Flowering period. September—October.

VANRHYNSDORP. *Rood* H 121—26 (K).

CLANWILLIAM. Near Graafwater, *Nouhuys* (PRE 7863); *Zinn* (SAM 59780); Nardouw Kloof, *Stokoe* (SAM 59781); *Barker* 272 (NBG); Pakhuis Pass, *Barker* 1226 (BOL, NBG); Langevalley, *Leighton* (BOL 21468, SAM); Olifants River Valley, *Stephens* 7101 (K); Cold Bokkeveld Mts., foothills opposite Warm Baths, *Stephens* 7104 (K).

PIKETBERG. Antonies River, *Leighton* 105 (BOL); Redlinghuis, *Barker* 2591, 2601 (NBG).

HOPEFIELD. Five miles E. of Hoetjies Bay, *Salter* 3936 (BOL); near Hopefield, *Letty* 70 (PRE); Velddrift, *Grant* 3464 (BOL).

WITHOUT LOCALITY. *Pappe* (K, SAM—*I. fulgens* Pappe MS.); *Villett* (K).

This variety is distinguished from var. *maculata* by its more rounded and slightly smaller bracts which are sometimes whitish all over but more often conspicuously bicoloured, whitish below and rust-coloured above, and by its flowers which are usually broadly bowl-shaped with wider, more rounded and often concave lobes, with the filaments usually connate to the middle, sometimes to the top. The dark circular stain in the middle of the flower rarely has a yellowish star-like pattern at its base. It closely resembles *I. curta* and is somewhat intermediate between that species and *I. maculata*, but distinguished from the former by its corm, which nearly always gives rise to one or more stolons terminating in a cormlet, its different bracts and shorter perianth tube which even in the largest flowers is not more than 8 mm. long and not or only shortly exserted from the bract, and also by its longer and narrower style branches.

In some herbaria this variety has been identified as *I. maculata* (or *I. conica*) and in others as *I. monadelpha*. In Flowering Plants of South Africa, t. 317, it was figured under the latter name, with the bracts shown very short and coloured green and the perianth tube over 1 cm. long and well exserted from the bract, although in the plant from which the plate was prepared the bracts are larger and pallid—possibly pale green at the base in the living state—and the perianth tube is not more than 8 mm. long and only shortly exserted from the bract. The filaments are connate to the top in the flowers figured but in the South African Museum Herbarium there are some plants from the same locality which have their filaments connate to the middle and in the majority the bracts are rust-coloured at the apex.

Klatt cited *I. fulgens* Pappe MS. under *I. ovata* (Andr.) Klatt (= *I. conferta* Foster) but the two unlocalised plants named *I. fulgens* by

Pappe which I have seen are nearer to this variety of *I. maculata.* Flowers from a specimen in the South African Museum Herbarium were dissected and found to have their filaments connate to the middle and the style reaching to the base or middle of the anthers. In appearance these two plants resemble *I. patens* and it is possible that they are of garden origin and perhaps hybrids between that species and *I. maculata* var. *intermedia.*

Var. **fusco-citrina** (Desf. ex DC.) Lewis stat. nov. *I. fusco-citrina* Desf. ex DC. in Red. Lil. t. 86. 1805; Desf. Cat. Hort. Paris.

Distinguished from var. *maculata* by the colour of the flowers and longer perianth tube.

Corm, stem and *leaves* as in var. *maculata* but usually slightly larger and longer, the leaves sometimes up to 2 cm. wide. *Bract* oblong or obovate, obtuse, acute or cuspidate, sometimes with a cusp and 2 short teeth, 0·8—1·3 cm. long, greyish or purplish below and the upper half ferruginous, or pale below, purplish above and papyraceous at the apex. *Flowers* yellow with a dark purplish stain in the middle; *perianth tube* 1—2 cm. long, well exserted from the bract; *lobes* oblong or ovate-oblong, obtuse, 2—3 cm. long, 0·9—1·6 cm. wide. *Filaments* 4—5 mm. long, usually connate at the base; anthers diverging, 0·8—1·1 cm. long. *Gynaecium* as in var. *maculata.*

LECTOTYPE. Red. Lil. t. 86.

Flowering period. September—October.

WITHOUT LOCALITY. *De Candolle* (G); *Lamarck* (P); *Flanagan* 1742 (PRE, Z); *Marloth* 1755 (PRE); *Barker* 271 (NBG, from Ceres Wild Flower Show); *Rogers* (K).

De Candolle's plant in the Delessert Herbarium, Geneva, might be the one from which Redouté's figure was drawn but as I am uncertain about this I have selected the illustration as the lectotype. The date of publication of Desfontain's Catalogue, from which De Candolle adopted the name *fusco-citrina*, has not been ascertained. De Candolle also cited *I. capitata* var. Andr. Bot. Rep. t. 50 but this is the var. *maculata.*

A few plants in the Bolus Herbarium and Kew Herbarium (BOL No. 19885), grown in the garden of Dr. L. Bolus at Claremont, Cape Peninsula, and recorded as coming from Nieuwoudtville in the Calvinia Division, exactly match the type figure except that the flowers are about one third smaller. If this locality is correct it is the only one known for this plant which otherwise is well known in cultivation and is possibly of hybrid origin. The corm is like that of var. *maculata*, with pale greyish submembranous tunics, and gives rise to one or more slender stolons each bearing a cormlet at the end by means of which the plants rapidly multiply. In all other respects it is very near var. *maculata*, being distinguished only by its slightly larger flowers with a longer perianth tube, and the colour of the flowers which in var. *fusco-citrina* are primrose-yellow, sometimes flushed with red outside, the dark purplish stain in the middle having no yellow star-like pattern at its base. The bracts are often purplish in the lower or upper half.

30. **I. curta** Andr. Bot. Rep. t. 564. 1809; Baker, Journ. Linn. Soc. Bot. 16: 92. 1877; Dur. & Schinz, Consp. Fl. Afr. 5: 183. 1895. *I. monadelpha* De la R. var. *curta* (Andr.) Ker, Bot. Mag. t. 1378. 1811. *I. monadelpha* De la R. forma, Baker, Handbk. Irid. 164. 1892 et Fl. Cap. 6: 83. 1896. *I. crocea* Eckl. Top. Verz. 25. 1827, *nomen nud. Morphixia curta* (Andr.) Klatt, Abh. Naturf. Ges. Halle 12: 384 et Erganz. 50. 1882. *Gladiolus luteus* Schrank (? *nomen nudum*); non Lam. 1786.

Corm ovoid or subglobose, 1—1·5 cm. diam.; tunics of fine reticulate fibres. *Stem* 15—40 cm. high, simple or with 1 short more or less patent branch. *Basal sheaths* 2, 1·5—4 cm. long, the lower obtuse or subacute and upper acute. *Leaves* 4—6, lanceolate, moderately firm, several-veined with the margins and midrib slightly prominent, erect, suberect or the 3 lower somewhat patent, sometimes spirally twisted, 8—25 cm. long, 3—6 mm. wide. *Spike* short, compact, 3—8-flowered, the rachis flexuose. *Bract* oblong or ovate-oblong, 0·7—1 cm. long, usually pallid with the upper half flecked or speckled with brown or reddish brown, carinate, nearly always with a short cusp or mucro and 2 short teeth; *bracteoles* bicarinate, bifid, cuspidate or mucronate. *Flowers* fairly large, usually broadly crateriform but the lobes patent when fully expanded in bright sunlight, orange with a brown or greenish brown circular stain in the middle often outlined by a reddish band, the outer lobes often flushed with red outside; *perianth tube* cylindrical, 1—1·5 cm. long, well exserted from the bract; *lobes* connate for 1—2 mm., obovate, obovate-oblong or occasionally ovate, obtuse, 2—2·5 cm. long, 1—1·5 cm. wide, equal or the outer slightly longer and wider than inner. *Stamens* arising at top of perianth tube, the filaments 3—4 mm. long, usually completely connate; anthers linear, erect, 0·9—1 cm. long. *Ovary* ellipsoid or rotund, about 4 mm. long; style reaching shortly above the base or to middle of anthers, the branches spathulate, conduplicate, 2—3 mm. long, with recurved tips projecting between the anthers.

LECTOTYPE. Andrew Bot. Rep. t. 564.

Sandy flats and hill slopes in the Malmesbury and Hopefield Divisions.

Flowering period. October.

HOPEFIELD. Theefontein road, *Bachmann* 1216 (Z).

MALMESBURY. Swartland, *Bachmann* 1218 (Z); Darling Flora Reserve, *Barker* 8660 (NBG); *Lewis* 5084 (NBG); between Malmesbury and Moorreesburg, *Pillans* (BOL); Darling, *Ross-Frames*, NBG 1403/26

(BOL); Groenekloof, *Ecklon* and *Zeyher* (PRE—named *I. vitellina* Eckl.); Kalabaskraal, *Werdermann* and *Oberdieck* 320 (B, PRE).

WITHOUT LOCALITY. *Ecklon* 433 (M, K, PRE—named *I. crocea* Eckl.); *Brehm* (BR—? type of *Gladiolus luteus* Schrank).

This has been variously treated as a distinct species or a variety or form of *I. monadelpha* by Andrew, Ker, Klatt, Baker and others. In his Systema Iridacearum Baker treated it as a species and, on account of its united filaments, placed it with *I. monadelpha* in a separate subgenus, *Eurydice* (Journ. Linn. Soc. Bot. 16: 92. 1877), but in the Flora Capensis he listed it as one of several named forms of *I. monadelpha*. It is undoubtedly closely allied to *I. monadelpha* but I have followed those botanists who regarded it as distinct since the following differences seem to warrant this: (i) The corm tunics of *I. curta* are composed of moderately fine blackish reticulate fibres, and those of *I. monadelpha* are greyish, soft and more or less papyraceous. (ii) The plants in both species are about the same height but the stem is nearly always simple in *I. curta* and generally branched in *I. monadelpha*. Andrew's figure of *I. curta* represents an unusually stunted plant. (iii) The flowers of *I. curta* are larger and usually broadly crateriform (except in bright sunshine at mid-day), with a somewhat stouter perianth tube and considerably broader lobes.

Klatt cited *Gladiolus luteus* Schrank as a synonym of *Morphixia curta* (Andr.) Klatt, but this name is not listed in the Kew Index and I have not been able to ascertain whether it was ever published or if it is merely a MS name. In the herbarium of the Botanical Gardens, Brussels, there is a specimen of *Ixia curta* named *Gladiolus luteus* Schrank, collected by Brehm, and in the Botanische Staatssammlung, Munich, a specimen of *I. dubia*, also collected by Brehm, No. 151, is named *Gladiolus luteus* Schrank.

Some of the plants distributed as *Ixia vitellina* Eckl., a *nomen nudum*, are *I. curta* and others *I. maculata*, which it closely resembles in the dried state.

31. **I. monadelpha** De la R. Desc. Pl. Nov. 22. 1766; Ker, Bot. Mag. t. 607. 1802 et Gen. Irid. 101. 1827; Baker, Journ. Linn. Soc. Bot. 16: 92. 1877, Handbk. Irid. 164. 1892 et Fl. Cap. 6: 82. 1896; Dur. & Schinz, Consp. Fl. Afr. 5: 185. 1895; Lewis in Adamson & Salter, Fl. Cap. Pen. 249. 1950. *I. monadelphia* Burm. f. Fl. Cap. Prod. 1. 1768. *I. cartilaginea* Lam. Encyc. 3: 340. 1789 et Illustr. 1: 112. 1791. *I. columnaris* Salisb. Prod. 36. 1796. *I. columnaris* var. *grandiflora* Andr. Bot. Rep. t. 250. 1802. *I. grandiflora* (Andr.) Pers. Syn. 1: 48. 1805; Klatt ex Dur. & Schinz, l. c. 184. *I. columnaris* var. *latifolia* Andr. l. c. t. 213; *I. columnaris* var. *purpurea* Andr. l. c. t. 203. *I. purpurea* (Andr.) Klatt ex Dur. & Schinz,

l. c. 186. *I. columnaris* var. *angustifolia* Andr. l. c. t. 392. *I. angustifolia* (Andr.) Klatt ex Dur. & Schinz, l. c. 182; non Eckl. 1827. *I. columellaris* Ker, Bot. Mag. t. 630. 1803; Baker, Handbk. Irid. 163 et Fl. Cap. 6: 81; Dur. & Schinz, l. c. 183. *I. columellaris* var. *rhodolarynx* Baker, Journ. Linn. Soc. Bot. 16: 91. *I. variegata* Banks ex Schult. Mant. 1: 328. 1822, *nomen nud.* *I. galaxioides* Klatt ex Dur. & Schinz, l. c. 184. *Galaxia ixiaeflora* Red. Lil. t. 41. 1802 (*G. ramosa* in textu). *Morphixia grandiflora* (Andr.) Klatt, Abh. Naturf. Ges. Halle 12: 383 et Erganz. 49. 1882. *M. latifolia* (Andr.) Klatt, l c. 385 et 51. *M. purpurea* (Andr.) Klatt, l. c. 383 et 49. *M. angustifolia* (Andr.) Klatt, l. c. 384 et 50. *M. columellaris* (Ker) Klatt, l. c. 384 et 50.

Corm globose or depressed-globose, 1·3—2 cm. diam.; tunics soft, greyish, somewhat papyraceous. *Stem* 15—40 cm. high, firm, often moderately stout, usually with 1 or 2 short patent curved branches. *Basal sheaths* 2, acute, 1·8—8 cm. long. *Leaves* 4—7, the 3 or 4 basal patent to suberect, lanceolate or ensiform, 8—28 cm. long, 0·3—1 cm. wide, usually spirally twisted, firm, several-veined, sometimes with narrow cartilaginous margins. *Spike* short, closely 4—12-flowered, the rachis usually flexuose. *Bract* oblong or obovate-oblong, 0·5—1 cm. long, nearly always opaque, pale below and minutely flecked or spotted with reddish or dark brown towards the apex, carinate, acute, truncate or more often with a somewhat conspicuous short to fairly long dark cusp or mucro and 2 short teeth; *bracteoles* bicuspidate or with dark more or less recurved mucros. *Flowers* variable in colour, pale or dark blue, violet, mauve, purplish, pale pink or white, all with a circular stain in the middle nearly always outlined with a band of another colour, the middle usually green, brown or dull reddish brown and the outer band often brownish; *perianth tube* cylindrical, slender, 1—1·8 cm. long; *lobes* connate for 1—1·5 mm., patent, equal, oblong, obtuse, 1·3—2 cm. long, 0·6—1·1 cm. wide, about as long as the tube or slightly shorter or longer, occasionally obovate or obovate-oblong and up to 1½ times as long as the tube. *Stamens* arising at top of perianth tube, the filaments 3—6 mm. long, nearly always connate to the middle or top; anthers linear, 7—8 mm. long, more or less connivent. *Ovary* rotund, about 3 mm. long; style reaching to shortly above the base or middle of anthers, occasionally nearly to the top, the branches spathulate or subspathulate, conduplicate, minutely ciliate, 2—3 mm. long, with recurved tips projecting between the anthers.

HOLOTYPE. *Burmann* in Herb. Delessert, Geneva.

Flats and hill slopes in sandy ground or marshy vleis.

Flowering period. September—December.

TULBAGH. *Pappe* (SAM 20928); ? *Zeyher* (K).

MALMESBURY. Darling Flower Show, *Maguire* 446 (NBG); Darling, *van Breda* 1053 (NBG, PRE).

BELLVILLE. Tygerberg, *Prior* (K).

CAPE. Near Riet Vlei, *Zeyher* 1601 (G, K); Salt River, *Zeyher* 4667 (BOL); *Pappe* (BM); near Hout Bay, *MacOwan* 2481 (K, SAM); *MacOwan* HNAA 266 (BM, G, K, UPS); near Camps Bay, *Dod* 1785 (BM, BOL); *Zeyher* (BOL); *Pappe* (BM, K); between Clifton and Camps Bay, *Goulinis* (BOL 26870); Green Point, *Pappe* (SAM 20927); Rondebosch Common (Camp Ground), *Zeyher* 5039 (BOL); *Salter* 9005 (BOL); *Bolus* 4899 (BOL); *Compton* 16578 (NBG); *L. Bolus* (BOL 20996, K, PRE).

WITHOUT LOCALITY. *Burmann* (G); *Thunberg* (UPS, *I. maculata* sheet 9); *Zeyher* 436 (BOL); *Ecklon* and *Zeyher* (PRE, Z); *Lamarck* (P—type of *I. cartilaginea* and specimens named *I. monadelpha*); *Oldenburg* 62, 699 (BM); *Drege* 8363 (S), 8373 (BM, K, L, P); *Villett* (K); *Forster* (K); *Gill* (K); *Mund* (K); *Brehm* (M); *Hahn* (Z); *De Candolle* (G); *Moricand* (G).

This species is probably the most variable in the genus, with many different colour forms. One of its distinguishing characters is the way in which the stamens are arranged in an erect column with the filaments almost always united to the middle or the top and anthers more or less connivent with the tips of the short style branches projecting between them. When these organs are concealed in herbarium specimens it is very often possible to recognize the species by its bracts and bracteoles which are generally spotted or streaked with dark brown at the apex and frequently have somewhat conspicuous cusps or mucros.

Four or five colour forms of this species, figured by Andrew as varieties of *I. columnaris*, a synonym of *I. monadelpha*, were later raised to specific status by Klatt who placed them in the genus *Morphixia*. One of them, *M. versicolor* (Andr.) Klatt (= *Ixia columnaris* var. *versicolor* Andr. Bot. Rep. t. 211) is possibly a hybrid with *I. curta* Andr., which it resembles in having orange-yellow flowers partly reddish brown outside and inside a large dark brown or blackish circle in the middle with radiating red lines, but the lobes are much narrower and are patent, as in *I. monadelpha*. A few of the flowers figured as varieties of *I. maculata* by Jacquin in his Hortus Schoenbrunniensis, tt. 21 and 22, are undoubtedly hybrids of *I. monadelpha*; in some of them the stamens are depicted in an upright column with the tips of the style branches just showing between the anthers.

Ker distinguished *I. columellaris*, Botanical Magazine t. 630, from *I. monadelpha* by its filaments not being connate beyond the base (which occasionally happens in *I. monadelpha*), by the way in which the flowers expand, and its having fragrant flowers and a different flowering time, but for all this I think it is no more than a form of the very variable *I. monadelpha.*

In the Flora Capensis Baker cited *Ixia cartilaginea* Lam. in the synonymy under *Watsonia marginata* (Vol. 6, p. 104), a mistake which he could not have made had he seen the type in Lamarck's herbarium in Paris. The specimen named *Ixia cartilaginea* is a poor one, with only the remains of one flower, but the plant is obviously an *Ixia* and from its appearance and Lamarck's description there is little doubt that it is *I. monadelpha.*

The section *Eurydice* of Persoon, or subgenus *Eurydice* (Pers.) Baker, distinguished by the connate filaments, is not upheld as this character has been found to be unreliable and no great importance can be attached to it. In *I. monadelpha*, the only species placed in the subgenus by Baker, the filaments are nearly always partly to entirely connate, but in *I. maculata* and its varieties they vary from free to partly or sometimes entirely connate, and in *I. dubia* they are occasionally connate at the base.

SECTION **HYALIS**

(Salisb. ex Baker) Diels in Engl. & Prantl Pflanzemfam. ed. 2. 15 a: 486. 1930. *Hyalis* Salisb. Trans. Hort. Soc. 1: 317. 1812, pro gen., nomen nudum. *Ixia* subgenus *Hyalis* Salisb. ex Baker, Handbk. Irid. 161. 1892 et Fl. Cap. 6: 77. 1896. *Houttuynia* Houtt. Nat. Hist. 12: 448. 1780, pro gen., nom. rejic.; non Thunb. 1784, nom. cons. *Freesea* Eckl. Top Verz. 30. 1827, pro gen., nomen nudum.

Perianth tube 2 cm. or more long, slender, subcylindrical, slightly and gradually expanded from base to throat or in the upper third, usually distinctly longer than the lobes; stamens arising shortly or well below top of tube, included in the tube or exserted.

(Exception: In southern form of *I. longituba* the perianth tube is shorter, 1·2—1·8 cm. long, sometimes slightly shorter than the lobes).

Type species: *I. paniculata* De la R.

32. **I. paniculata** De la R. Descr. Pl. Nov. 26. t. 1. 1766; Baker, Handbk. Irid. 166. 1892 et Fl. Cap. 6: 85. 1896. *Morphixia paniculata* (De la R.) Baker, Journ. Linn. Soc. Bot. 16: 97. 1877. *Tritonia paniculata* (De la R.) Klatt, Abh. Naturf. Ges. Halle 12: 358 et Erganz. 24. 1882; Dur. & Schinz, Consp. Fl. Afr. 5: 206. 1895. *Ixia longiflora* Berg. Descr. Pl. Cap. 7 et 360. 1767; Lam. Encyc. 3: 342. 1789 et Illustr. 1: 112. 1791 (excl. ref. Mill. Ic.); Ait. Hort. Kew. 1: 58 (excl. syn. *Gladiolus longiflorus* L.f.); Curtis, Bot. Mag. t. 256. 1794 (excl. syn. *G. longiflorus* L.f.); Red. Lil. t. 34. 1803. *Gladiolus longiflorus* var. Jacq. Ic. t. 263. 1786—93 et

G. longiflorus Jacq. Coll. Suppl. 23. t. 7. f. 1. 1796; non L.f. 1781. *Hyalis longiflora* Salisb. Trans. Hort. Soc. 1: 318. 1812 (excl. syn. *Gladiolus longiflorus* L.f.), *nomen nudum. Tritonia longiflora* Ker in Koenig & Sims Ann. Bot. 1: 222. 1805 et Bot. Mag. t. 1502. 1812. *Freesea longiflora* Eckl. Top. Verz. 30. 1827, *nom. nud. Houttuynia capensis* Houtt. Nat. Hist. 12: 448. t. 85. f. 3. 1780; Panzer, Pflanzensyst. 11: 523. t. 85. f. 3. 1784. *Gladiolus ixioides* Thunb. Fl. Cap. 208. 1811. *Ixia longiflora* var. b. Willd. Sp. Pl. 1: 203. 1797. *I. tenuiflora* Vahl, Enum. 2: 66. 1806. *Tritonia tenuiflora* (Vahl) Ker, Bot. Mag. sub t. 1275. 1810; Lodd. Bot. Cab. t. 1078. 1825; Klatt, Abh. Naturf. Ges. Halle 12: 358 et Erganz. 24; Dur. & Schinz, l. c. 208. *Morphixia paniculata* (De la R.) Baker var. *tenuiflora* (Vahl) Baker, Journ. Linn. Soc. Bot. 16: 97. *Ixia paniculata* De la R. var. *tenuiflora* (Vahl) Baker, Handbk. Irid. 166 et Fl. Cap. 6: 85. *Tritonia concolor* Sweet Brit. Fl. Gard. 398. 1827 et ed. 2. 502. 1830. *Waitzia concolor* Heyn. Nom. 1: 854. 1840, *nom. illeg. W. longiflora* Heyn. l. c., *nom. illeg. W. tenuiflora* Heyn. l. c., *nom. illeg.*

Corm globose, 1—1·5 cm. diam.; tunics pale brown, soft and somewhat membranous. *Stem* 30 cm. to 1 m. high, the lower half sometimes fairly stout, usually with 1 or 2 patent or suberect branches. *Leaves* erect or suberect, linear to lanceolate, moderately firm, 15—60 cm. long, 0·3—1·2 cm. wide. *Spike* 4—14 cm. long, fairly laxly to closely 5—18-flowered, the flowers erect or suberect. *Bract* oblong or lanceolate, acute or shortly cuspidate, 0·8—1·5 cm. long, soft and sometimes lacerated at the apex, pale brown or pallid, the lower half usually subhyaline; *bracteoles* bicarinate, bicuspidate or bidentate. *Flowers* pale or deep cream, occasionally yellowish, the outer lobes often partly pink or reddish outside and sometimes also the throat of the tube; *perianth tube* slightly and gradually expanded from base to throat, 4—7 cm. long, 3—5 mm. diam. at the throat; *lobes* less than half as long as tube, oblong or linear-oblong, obtuse or subemarginate, 1·5—2·5 cm. long, 3—8 mm. wide, equal or the outer sometimes larger than inner. *Stamens* arising in the perianth tube, the filaments shortly decurrent, 5—6 mm. long, not exserted; anthers 6—8 mm. long, linear, sagittate, usually purplish, varying from almost entirely included in the tube to almost entirely exserted. *Ovary* rotund, 3—4 mm. long; style sometimes directed to one side of stamens, reaching to base middle or top of anthers or sometimes extending well above them, the branches 1·5—2 mm. long, spathulate, conduplicate, recurved at the apex.

Lectotype. De la Roche Descr. t. 1.

Flats and plateaux from the Clanwilliam Division to the Cape and Caledon Divisions, usually in marshy ground.

Flowering period. September—December.

CLANWILLIAM. *Le Roux* (BOL 21809); Brakfontein, *Rabinowitz*

(SAM 68440); between Citrusdal and Clanwilliam, *Thorne* (SAM 49907); Citrusdal, *van Zyl*, NBG 619/27 (NBG); Brandewyn Rivier, *Middlemost* 1896 (NBG); Pakhuis Pass, *Thode* A 2139 (K, PRE); Pikeniers Pass, *Pearson* 5205 (K).

PIKETBERG. St. Helenafontein, *L. Bolus* (BOL 22298, SAM); between Bergvalei and Langevalei, *Drege* (K); Bergvalei, *Drege* 1563 (P).

HOPEFIELD. *Pattison* (BOL 13674); *Bachmann* 1220 (Z).

MALMESBURY. Near Bok Point, *Barker* 1225 (NBG); between Darling and Bokbaai, *Esterhuysen* 4376 (NBG, PRE); *Thomas* (NBG); Groenekloof, *Zeyher* 1620 (BM, BOL, G, K, PRE, SAM); "Blijdskap", *Pillans* 1225 (BOL).

BELVILLE. Between Tygerberg and Paardeberg, *Pappe* (SAM 20943).

CAPE. Rietvlei, *Zeyher* (SAM 20944); Camps Bay, *Dod* 1785 (K); near Cape Town, *Bolus*, HNAA 476 (BM, BOL, G, K, SAM, UPS, Z); Table Mt., 3,000 ft., *Bolus s. n.* (NBG, PRE, S); Rondebosch, *Dod* 381 (BM, BOL); Kenilworth Race Course, *Salter* 8704 (NBG); Wynberg, *Bolus* 4513 (BM, BOL, Z); Princess Vlei, *MacOwan* 3159 (SAM); near Retreat Station, *Salter* 4006 (K); Kommetjie, *Hayter* (PRE); Schusters Kraal (Scarborough), *Compton* 5971 (NBG); *Linley* (SAM 56069); Buffels Bay, *Compton* 6386 (NBG); *Salter* 1870 (BOL); Redhill, *Jameson* (K); Witsands, *Werdermann* and *Oberdieck* 817 (B, PRE).

CALEDON. *Marloth* 5939 (PRE); Hangklip Estate, *Porter* (BOL 26897).

WITHOUT LOCALITY. *Burchell* (K); *Niven* 22 (BM); *Wallich* (BM); *Drege* (BM, G); *Ecklon* 281 (G); *Jussieu* 3625 (P); *Lamarck* (P); *Brehm* (BR) *Ecklon* and *Zeyher* (Z); *Thunberg* (G, S); *Sieber* (G); *Verreaux* (G); *Ventenat* (G); *Thunberg* (UPS—type of *Gladiolus ixioides*).

This species is fairly widespread and very variable, with three or four distinct forms which merge into one another. Three forms are illustrated on one plate in the Botanical Magazine, t. 1502, where they are named *Tritonia longiflora* by Ker. The large figure in the centre represents the northern form, found in the Clanwilliam and Piketberg Divisions, and this same form was figured by Jacquin as *Gladiolus longiflorus* var. (Ic. t. 263). It has a slightly longer and laxer spike and narrower perianth lobes than the southern form, but intermediates between these two occur in the Piketberg and Hopefield Divisions. The short-tubed form, named *Ixia tenuiflora* by Vahl and treated as a variety of *I. paniculata* by Baker, is also variable and as it has been found growing together with the typical long-tubed southern form as illustrated on plate 256 of the Botanical Magazine, I do not consider that it can be upheld as a variety. The difference in the length of the style is shown in the three forms figured on plate 1502 of the Botanical Magazine, where it can be seen to vary from well exserted to completely included in the perianth tube. In 1827 one of these forms was named *Tritonia concolor* by Sweet.

The species was originally described and figured as *Ixia paniculata* by De la Roche in 1766 and in the 190 odd years since then it has been renamed more than once and transferred from one genus to another by various authors. In 1767 it was named *I. longiflora* by Bergius and his specific epithet was used by most of the authors who subsequently transferred the species to other genera.

In 1780 it was figured and described as *Houttuynia capensis* by Houttuyn, but his figure was misinterpreted by Ker who identified it with the plant he illustrated and described as *Tritonia capensis* in the Botanical Magazine, t. 618, in 1803. More than a hundred years elapsed before this mistake was recognized and pointed out by Merrill (Journ. Arn. Arb. 19: 327. 1938—see historical note at beginning of this paper).

The plant figured as *Gladiolus longiflorus* var. by Jacquin on plate 263 of his Icones represents one of the forms of *Ixia paniculata*, but the plant named *Gladiolus longiflorus* by Linnaeus f. and Thunberg, which they assumed to be the same as *Ixia longiflora* Berg., is not this species. N. E. Brown pointed out this mistake in 1928 after examining the South African Iridaceae in Thunberg's herbarium (Journ. Linn. Soc. Bot. 48: 24), and correctly identified Thunberg's plant with a species of *Tritonia*. In 1811 Thunberg described a specimen of *Ixia paniculata* in his herbarium as *Gladiolus ixioides*, believing it to be an unnamed species.

Ixia paniculata was figured as *I. longiflora* on plate 256 of the Botanical Magazine, but three years later Ker transferred it to *Tritonia* as *T. longiflora*, and in 1812 figured the three forms mentioned above on plate 1502 of the Botanical Magazine.

In 1812 Salisbury published the generic name *Hyalis* in the Transactions of the Horticultural Society (Vol. 1, p. 318), in association with four species of *Ixia*, but as he gave no generic characters *Hyalis* is a *nomen nudum*. One of the combinations he made was *H. longiflora*, for which he cited as synonyms *Ixia longiflora* Curt. Bot. Mag. t. 256 and *Gladiolus longiflorus* L. f. Suppl. 96, but as explained above, these are not the same.

Freesea Eckl., published in 1827, is another *nomen nudum*. Of the five species associated with the name by Ecklon, four belong to the genus *Tritonia* but one, *Freesea longiflora* Eckl. (syn. *Tritonia longiflora* Ker), is *Ixia paniculata*.

The generic name *Waitzia*, published by Reichenbach in 1828 (Consp. 60) is illegitimate as the name had already been used ten years earlier by Wendland for a genus of Compositae. In 1840 Heynbold made several illegitimate new combinations with *Waitzia* Reichb., among them *W. concolor*, *W. longiflora* and *W. tenuiflora*, based on *Tritonia concolor*, *T. longiflora* and *T. tenuiflora*, all of which, as mentioned above, are synonyms of *Ixia paniculata*.

33. **I. splendida** Lewis, Journ. S. Afr. Bot. 4: 9. 1938.

Corm subglobose, about 1·5 cm. diam.; tunics of fine reticulate fibres, sometimes extending up in a neck 0·5—1·5 cm. long. *Stem* slender, simple, 30—60 cm. high. *Basal sheaths* 3, the lowest acute and others acuminate, 3·5—11 cm. long. *Leaves* 4—5, erect, reaching a little above middle of stem, the 3 basal linear, 18—45 cm. long, 2—3 mm. wide, with slightly prominent margins and mid-rib, the 1 or 2 cauline almost entirely sheathing. *Spike* short, capitate, closely 5—7-flowered. *Bract* oblong, 7—8 mm. long, obtuse or subtruncate with a small cusp, or shortly and unequally tridentate, thin, 1—7-veined, the lower half more or less pellucid and upper minutely flecked with brown; *bracteoles* bicarinate, bicuspidate. *Flowers* erect, pale pink; *perianth tube* 2·2—2·8 cm. long, slightly and gradually expanded from base to throat, 3—5 mm. diam. at the throat; *lobes* equal, oblong, obtuse or subemarginate, 1·5—1·8 cm. long, 6—8 mm. wide. *Stamens* arising in perianth tube, included or occasionally the tips of the anthers exserted; filaments 4—5 mm. long; anthers 5—6 mm. long, subsagittate. *Ovary* subglobose, 2—3 mm. long; style reaching to base or middle of anthers, the branches about 1·5 mm. long, filiform, conduplicate, slightly expanded and minutely ciliate towards the apex.

HOLOTYPE. *Pillans* 7183 in the Bolus Herbarium.

Flowering period. October—November.

PIKETBERG. Zebra Kop, near stream, *Pillans* 7183 (BOL, PRE, SAM).

This attractive species, with delicate rose-pink flowers, is nearest *I. paniculata*, from which it differs in having an unbranched stem, shorter perianth tube and the anthers included in the tube. It appears to be local on the Piketberg Mts. and is known only from the one locality recorded above.

34. **I. paucifolia** Lewis, S. Afr. Gard. 23: 213. 1933. *I. bolusii* Lewis, Journ. S. Afr. Bot. 4: 10. 1938.

Corm ovoid or subglobose, 1—2·8 cm. diam.; tunics of fine or fairly coarse reticulate fibres. *Stem* 12—55 cm. high, usually 15—30 cm., slender, simple or with 1 or 2 short patent or suberect branches. *Basal sheaths* 2, 2—7 cm. long, the lower colourless, obtuse, and upper acute usually with the upper half ferruginous. *Leaves* 3 (rarely 2), the basal lanceolate or linear-lanceolate, 8—30 cm. long, 0·3—1 cm. wide, somewhat coriaceous with the mid-rib prominent and narrow cartilaginous margins, the lower sometimes falcate and second more or less erect; third leaf entirely sheathing. *Spike* short, closely 3—11-flowered. *Bract* ovate-oblong or oblong, 6—9 mm. long, acute, cuspidate, sometimes with 2 short teeth, tridentate or occasionally truncate, pellucid, conspicuously 3-veined, sometimes minutely flecked with brown near the apex; *bracteoles* bicarinate, bicuspidate. *Flowers* erect, white or cream-coloured with the outer lobes sometimes mauve outside, occasionally pale or deep pink; *perianth tube* 2·2—3·5 cm. long, filiform at the base, gradually expanded upwards and 1·5—3 mm. diam. at the throat; *lobes* usually less than half as long as the tube, oblong, ovate-oblong or occasionally suborbicular, 0·7—1·2 cm. long (rarely 1·4 cm.), 3—5 mm. wide (rarely 7 mm.), equal or the outer slightly longer and wider than inner. *Stamens* arising near top of perianth tube, the filaments decurrent, 2—4 mm. long, included or shortly exserted; anthers exserted, 3—5 mm. long, subsagittate. *Ovary* globose, about 2 mm. long; style reaching to base or top of anthers, the branches 1—1·5 mm. long, subspathulate, conduplicate, recurved.

HOLOTYPE. *Archer* 534 in the Bolus Herbarium.

Mountains in the Clanwilliam, Tulbagh and Ceres Divisions at altitudes up to 5,500 ft. and up to 4,000 ft. in karroid or semi-karroid districts from Worcester to Laingsburg.

Flowering period. September—November, sometimes up to January at high altitudes.

CLANWILLIAM. Elands Kloof, *Compton* 9702 (NBG); Cedarberg, Middelberg plateau, 4,000 ft., *Levyns* (CT 2266); *Esterhuysen* 12153 (BOL, PRE).

CERES. Bokkeveld Tafelberg, 5,500 ft., *Bond* 700 (NBG); *Esterhuysen* 3909 (BOL); Bonteberg, Eikenboschhoek, 4,000 ft., *Esterhuysen* 3772 (BOL); *Compton* 10003 (NBG).

TULBAGH. Great Winterhoek, 4,000 ft., *Esterhuysen* 19878 (BOL); *Marloth* 1725, 2328 (PRE).

WORCESTER. Hex River Valley near De Doorns, c. 1,700 ft., *Bolus* (BOL 13197—type of *I. bolusii*, K, PRE).

MONTAGU. Concordia Valley, *Cook*, NBG 1704/22 (BOL); same, 3,000 ft., *Levyns* 282 (CT); Koo, 4,000 ft., *Compton* 3839 (BOL); between Concordia and Eendragt, *Tredgold* 457 (PRE).

LADISMITH. Van Wyksdorp, *Archer* 534 (BOL).

LAINGSBURG. Cabidu, *Hall* 170 (NBG); *Olivier* (NBG); Tweedside, *Marloth* 10827 (PRE).

In Supplement 9 of the Kew Index *I. paucifolia* Lewis was incorrectly recorded as *I. pauciflora*.

The species differs from *I. paniculata*, to which it is most nearly allied, in having fewer leaves, usually three but sometimes only two, and smaller flowers with a shorter tube. Like *I. paniculata* it is very variable but the forms merge into one another and cannot be regarded as distinct varieties. The typical form, which occurs in karroid or semi-karroid areas, has much harder and darker corm tunics than the others, and the lowest leaf more or less falcate. In the late-flowering form from high mountains in the Ceres and Tulbagh Divisions the perianth lobes are considerably wider than in the typical, sometimes suborbicular.

35. **I. bellendenii** Foster, Contrib. Gray Herb. No. 114: 47. 1936. *Tritonia rochensis* Ker, Bot. Mag. t. 1503. 1812, excl. syn., et Gen. Irid. 114. 1827; Klatt, Abh. Naturf. Ges. Halle 12: 358 et Erganz. 24. 1882; Dur. & Schinz, Consp. Fl. Afr. 5: 207. 1895. *Ixia paniculata* var. *rochensis* (Ker) Baker, Handbk. Irid. 166. 1892 et Fl. Cap. 6: 85. 1896. *Morphixia paniculata* var. *rochensis* (Ker) Baker, Journ. Linn. Soc. Bot. 16: 97. 1877. *Ixia rochensis* (Ker) L. Bolus, Journ. Bot. 67: 133. 1929; non Ker 1802. *Waitzia rochensis* Heyn. Nom. 1: 854. 1840, *nom. illeg.*

Corm 1·5—2 cm. diam.; tunics of fine reticulate fibres. *Stem* usually 45—60 cm. high, simple or with 1—3 short curved branches. *Basal sheaths* 2—3, acuminate, 6—12 cm. long, occasionally up to 18 cm. *Leaves* 4—5, erect, the 2 or 3 basal lanceolate or ensiform, 15—40 cm. long, 0·6—1·5 cm. wide, many-veined, sometimes with the mid-rib and margins fairly prominent and cartilaginous; cauline leaves 2, sheathing. *Spike* 5—12 cm. long, laxly to fairly closely 6—12-flowered. *Bract* oblong or ovate, 0·7—1 cm. long, tricuspidate and conspicuously 3-veined or 1-veined and with a single cusp, usually colourless or pale straw-coloured; *bracteoles* bicarinate, bicuspidate. *Flowers* large, cream-coloured, faintly flushed with pink outside, usually with a small green stain at the throat; *perianth tube* 2·5—3·5 cm. long, slender, gradually and slightly expanded in the upper half, faintly striate, usually becoming curved as the flower matures; *lobes* 1·6—2 cm. long, 0·7—1 cm. wide, oblong or obovate-oblong, concave with the apex slightly involute, obtuse or emarginate. *Stamens* arising near top of perianth tube, the filaments shortly decurrent, well exserted, 7—8 mm. long; anthers 5—7 mm. long, sagittate. *Style* reaching to middle or top of anthers, the branches 3—4 mm. long, linear with the apex slightly expanded or linear-spathulate, conduplicate.

LECTOTYPE. Botanical Magazine t. 1503.

Flowering period. October.

CALEDON. Villiersdorp, *Leipoldt* 3610 (BOL).

BREDASDORP. Baardskeedersbos, between Elim and Gansbaai, *Stokoe* (SAM 59777).

WITHOUT LOCALITY. Bolus Herb. 15829, 21810 (collector not recorded).

A specimen in Kew Herbarium, collected by Thom and recorded as coming from Tulbagh, is probably a form of this species but differs from the plants described above in having slightly shorter filaments, longer anthers and longer style branches (5 mm.).

The species is very closely allied to *I. longituba* but has somewhat larger flowers, usually with a longer tube more gradually expanded in the upper half, often becoming curved as the flower matures, and slightly longer stamens. When Ker described and figured it as *Tritonia rochensis* in 1812 he made no reference to *Ixia aristata* Ker (= *I. longituba*) but mentioned as nearly allied species *Tritonia longiflora*, *T. capensis* and *T. pallida*. The first is *Ixia paniculata* and the other two are species placed in the genus *Tritonia* as it stands at present.

Baker transferred *Tritonia rochensis* to *Ixia* as a variety of *I. paniculata* but it is quite distinct from that species, having different leaves, a shorter perianth tube with comparatively longer lobes and very much longer filaments far exserted from the tube. In 1929 Dr. L. Bolus raised it to specific status, retaining Ker's epithet, but seven years later it was renamed *I. bellendenii* by Foster. As he explained, *I. rochensis* based upon *Tritonia rochensis* Ker in Bot. Mag. t. 1503 was a later homonym of *Ixia rochensis* Ker in Bot. Mag. t. 598 (1802), and although Ker transferred *I. rochensis* to *Geissorrhiza* in 1805, its brief existence in *Ixia* prevents the use of the specific name for another species.

36. **I. longituba** N. E. Br. (Fig. 5), Journ. Linn. Soc. Bot. 48: 44. 1928. *I. aristata* sensu Ker, Bot. Mag. t. 589. 1802, excl. syn.; Baker, Handbk. Irid. 162. 1892 et Fl. Cap. 6: 79. 1896; non Thunb. 1783.

Corm ovoid or subglobose, 1—1·8 cm. diam.; tunics of fairly fine fibres, vertical below becoming confluent and reticulate above the middle. *Stem* 35—75 cm. high (average 40—55 cm.), simple or with 1—3 short stiff curved branches with the lower half more or less patent and spike erect. *Basal sheaths* 1—2, acute or acuminate, 1·5—8 cm. long, the lower sometimes subhyaline and obtuse. *Leaves* 5—6, the 3 basal lanceolate or ensiform, usually much shorter than the stem, 10—30 cm. long, 0·8—1·4 cm. wide, firm, many-veined, with narrow cartilaginous margins, often spirally twisted, and the 2 or 3 cauline leaves longer, almost entirely sheathing. *Spike* 4—7 cm. long, fairly laxly 6—12-flowered. *Bract* oblong or ovate, 6—7 mm. long (sometimes to 9 mm.), tricuspidate and 3-veined or 1-veined with a cusp and 2 short teeth, pale pinkish mauve or straw-coloured, occasionally minutely brown-flecked at the apex; *bracteoles* bicarinate, bicuspidate. *Flowers* pale to deep pink, the outer lobes darker outside, or occasionally white; *perianth tube* 1·8—2 or sometimes to 3·2 cm. long but in the southern form only 1·2—1·8 cm. long, slender, cylindrical with the upper third or quarter slightly and gradually expanded upwards

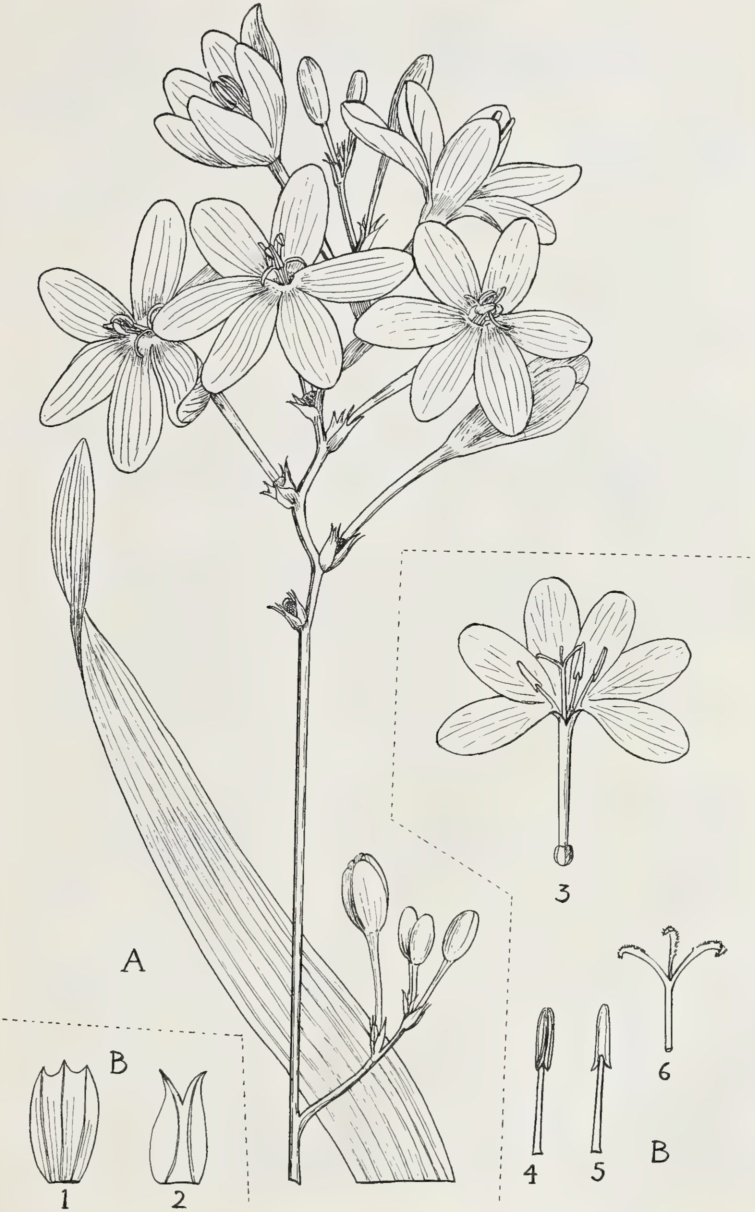


FIG. 5.—*I. longtituba*. A. Copied from Bot. Mag. t. 589 (*I. aristata* sensu Ker). B. *Lewis* No. 5562. 1. Bract × 2. 2. Bracteoles × 2. 3. Flower laid open. 4. Stamen, front view, × 2. 5. Stamen, back view, × 2. 6. Top of style × 2. Del. G. J. Lewis.

1·5—4 mm. diam. at the throat, sometimes subinfundibuliform; *lobes* oblong, obtuse or subemarginate, 1·2—2 cm. long, 0·7—1 cm. wide, the outer 1—2 mm. wider than inner, usually shorter or about as long as the tube but in the southern form slightly longer. *Stamens* arising slightly below top of perianth tube, the filaments shortly decurrent, 5—8 mm. long, well exserted; anthers 4—6 mm. long, subsagittate. *Ovary* rotund or obovoid, 2·5—3 mm. long; style reaching to middle of filaments or to middle of anthers, the branches filiform or linear-spathulate, conduplicate, 3—6 mm. long.

LECTOTYPE. Botanical Magazine t. 589.

Low slopes of mountains, hills and flats in the Caledon, Bredasdorp and Swellendam Divisions.

Flowering period. September—November.

CALEDON. *Prior* (K); near Genadendal, *Drege* 8375 (BM, G, K, P); Rietkuil, *Zeyher* 4013 (K); between Sonderend and Breede Rivers, *Zeyher* 4016 (K, PRE, SAM, S, Z); near Sonderend River, *Zeyher* (BOL, SAM); River Sonderend Mts., near Stormsvlei, Hassaquaskloof and Breede River, *Ecklon* and *Zeyher* 283 (G); 6 miles W. of River Sonderend, *Lewis* 5562 (NBG).

BREDASDORP. The Poort, near Bredasdorp, *Van Niekerk* 322 (NBG); between Napier and Caledon, *Steytler* (BOL 21748); between Bredasdorp and Elim, *Dymond* (BOL); *Loubser* 887 (NBG).

SWELLENDAM. *Van der Merwe*, NBG 1780/29 (BOL).

WITHOUT LOCALITY. *Thunberg* (S).

Some specimens in the South African Museum Herbarium collected by Leipoldt are recorded as coming from Clanwilliam but this must be a mistake as the species is not known to occur in that area.

In his notes on the South African Iridaceae of Thunberg's herbarium, Dr. N. E. Brown drew attention to the fact that the plant figured and described by Ker as *I. aristata* in the Botanical Magazine, t. 589, was not the same as *I. aristata* Thunb., and renamed it *I. longituba*. The type of *I. aristata* Thunb. is a small form of *I. campanulata* Houtt. (See note under that species.)

The length of the perianth tube is very variable in *I. longituba*. Specimens of *Drege* 8375 in Kew Herbarium, with a slender cylindrical tube up to 3·2 cm. long and lobes about half its length, were identified as *I. paniculata* var. *tenuiflora* by Baker, but the leaves, bracts, and flowers with well exserted stamens, are like those of *I. longituba* and not as in *I. paniculata*. In the Caledon Division the tube is generally about 2 cm. long and the lobes more or less the same length but towards the Bredasdorp Division it becomes shorter and in some of the southern forms it is only 1·2 cm. long and slightly shorter than the lobes.

SUBGENUS **DICHONE**

Ixia subgenus *Dichone* (Salisb. ex Baker) Lewis comb. nov.

Tritonia Ker subgenus *Dichone* Salisb. ex Baker, Handbk. Irid. 190. 1892 et Fl. Cap. 6: 118. 1896.

Tritonia Ker section *Dichone* "Laws." Salisb. ex Baker, Journ. Linn. Soc. Bot. 16: 162. 1877; Pax in Engl. & Prantl Pflanzenfam. II. 5: 155. 1888; Diels, ed. 2. 15 a: 490. 1930.

Dichone Laws. ex Salisb. Trans. Hort. Soc. 1: 320. 1812, nomen nud.

Tritonixia Klatt section *Dichone* (Salisb. ex Baker) Klatt, Abh. Naturf. Ges. Halle 12: 357 et Erganz. 23. 1882.

Tritonixia sensu Dur. & Schinz, Consp. Fl. Afr. 5: 209. 1895 (excl. sp. No. 1, *T. conferta* Klatt).

Agretta Eckl. Top. Verz. 23. 1827, nomen nud.

Flowers usually actinomorphic, in one or two species zygomorphic; *perianth tube* short, cylindrical, slender; *lobes* longer than the tube; *stamens* arising at top of perianth tube, usually symmetrically disposed but in one or two species the filaments slightly twisted and anthers reclinate, pendulous and not symmetrically disposed; filaments short; anthers small, suborbicular to oblong, often subdidymous, the cells opening widely from base to apex or by a narrow slit not extending to the apex; *style* reaching to top of perianth tube or shortly above, the branches involute-filiform or involute-cylindrical, straight or recurved, minutely clavellate or papillate at the apex only.

(Exceptions: flowers zygomorphic in *I. scillaris* and sometimes in *I. curvata*).

Type species: *I. crispa* L.f.

37. **I. micranda** Baker (Fig. 6), Journ. Bot. 1876, 237, Handbk. Irid. 162. 1892 et Fl. Cap. 6: 78. 1896; Klatt, Erganz. 62. 1882; Dur. & Schinz, Consp. Fl. Afr. 5: 185. 1895. *I. filifolia* Pappe ex Baker, Fl. Cap. 6: 78, *nomen nud.* ?*Agretta grandiflora* Eckl. Top. Verz. 23. 1827, *nomen nud.*

Corm globose, 1·3—2 cm. diam.; tunics matted, of very fine reticulate fibres extending up in a neck 1·5—4 cm. long. *Stem* filiform, simple, 20—60 cm. high. *Basal sheaths* 2 or 3, 3—7 cm. long, often partly concealed by the neck fibres. *Leaves* 2 (rarely 3), the lower 12—30 cm. long with the lower part sheathing and blade very narrow, usually terete, subterete or filiform, 0·5—1·25 mm. wide, striate with more or less prominent margins and mid-rib; upper leaf usually longer than lower, reaching above middle of stem, sometimes almost entirely sheathing. *Spike* short, 2—6-flowered, capitate, or somewhat longer and laxer, the rachis sometimes flexuose. *Bract* oblong or ovate-oblong, 5—8 mm. long, shortly tridentate

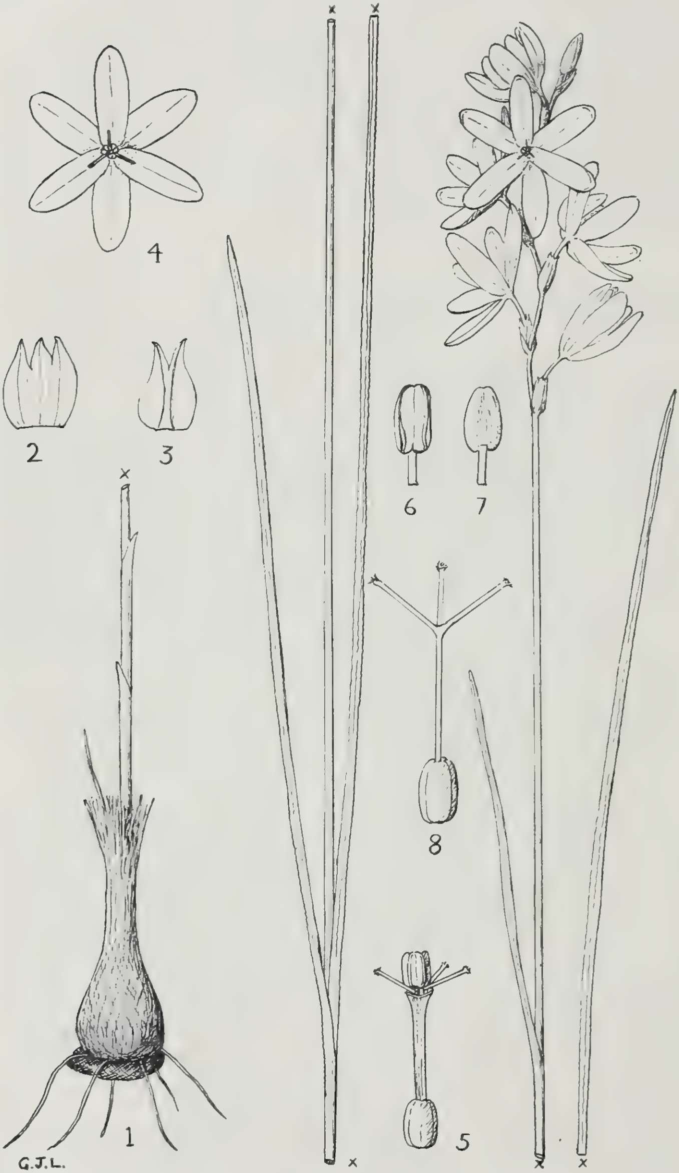


Fig. 6.—*I. micrandra. Lewis* No. 5733. 1. Corm and base of stem. 2. Bract × 2. 3. Bracteoles × 2. 4. Flower. 5. Flower, side view, perianth lobes removed, × 3. 6. Stamen, front view, × 5. 7. Stamen, back view, × 5. 8. Gynaecium × 4. Del. G. J. Lewis.

or tricuspidate, pellucid, colourless, brownish or pinkish mauve, with 3 or several veins; *bracteoles* bicarinate, shortly bicuspidate or bidentate. *Flowers* actinomorphic, white, pale to deep pink, mauve-pink or mauve; *perianth tube* filiform, 3—5 mm. long, not or very little exserted from the bract; *lobes* connate for 0·5—1 mm., oblong, obtuse or sometimes subacute or retuse, 1—2 cm. long, 5—7 mm. wide, equal or the outer slightly shorter and wider than inner. *Stamens* arising at top of perianth tube, symmetrically disposed; filaments very short, filiform, up to 1·5 mm. long; anthers subdidymous, oblong or suborbicular, 1·5—3 mm. long, 1—1·5 mm. wide, with a fairly narrow connective, the cells opening to the apex. *Ovary* oblong-rotund, 2—3 mm. long; style reaching to base of filaments, with involute-filiform branches 3—4 mm. long, minutely ciliate at the apex.

LECTOTYPE. *Zeyher* 4011 in Kew Herbarium.

Mountain slopes and hills in the Caledon and Bredasdorp Divisions.

Flowering period. July—August, occasionally up to October.

CALEDON. Houwhoek, *Zeyher* 4011 (K, PRE, SAM, S, Z); *van Niekerk* 395 (BOL); *Loubser* 931 (NBG); *Bolus* 12336 (BOL); *Ecklon* and *Zeyher* 92 (BM, G, K, SAM); near Bot River, *MacOwan* 2657, HNAA 262 (BM, BOL, G, K, SAM, UPS); *Barker* 113 (BOL, K); Sir Lowrys Pass to Hermanus, *Guthrie* 2005 (NBG); near Palmiet River and Houwhoek, *Drege* 8372 (BM, G, L, K, P); Elgin, *Lewis* 2002 (SAM); near Kleinmond, *Middelmann* (NBG); *Barker* 1 (BOL, K); Palmiet River Mts., *Middelmann* (BOL 24535); *Wilman* 627 (BOL, PRE); Palmiet River Mouth, *Davis* (SAM 60175); Caledon, *Guthrie* 2531 (BOL); *Purcell* (SAM); Swartberg, near Caledon, *Pappe* (K); *Worsdell* (K); *Zeyher* 4009 (K, PRE, Z); Shaws Pass, *Lewis* 3643 (SAM); Genadendal Mts., *Galpin* 4686 (BOL, K, PRE); River Sonderend Mts., *Stokoe* (SAM 57998); Highlands, *Lewis* 5733 (NBG).

BREDASDORP. Near Napier, *van Breda* 496 (M, PRE); near Bredasdorp, *van Niekerk* 430 (BOL); near Elim, *Guthrie* 3824 (NBG); *Smith* 3182 (PRE).

WITHOUT LOCALITY. *Thom* 357 (K); *Thunberg* (S).

Baker cited six collections when he described this species but did not designate any one as the type. Of these, *Zeyher* 4011, in Kew Herbarium, has been selected as the lectotype.

The species has been transferred to the subgenus *Dichone* on account of its small anthers and involute-filiform style branches which are stigmatic only at the apex. The two varieties described below have even smaller and more rounded anthers with the cells not opening right to the apex, the pollen being shed through a narrow slit, and shorter cylindrical style branches. Except for these differences there is little in the general appearance of the plants, especially the var. *minor*, to distinguish them from *I. micrandra*, with which they have generally been identified in herbaria.

Var. **minor** Lewis var. nov. (Fig. 7 B).

A var. *micrandra* filamentis brevioribus latioribus, antheris subsessilibus suborbicularibus thecis non ad apicem dehiscentibus, ramis styli brevioribus latioribus plus minusve tubulosis, differt.

Differs from var. *micrandra* in having shorter and wider filaments, the anthers subsessile, suborbicular with the cells not opening to the apex, and the style branches shorter, wider and more or less tubular.

Holotype. *Hutchinson* 481 in the Bolus Herbarium.

Flowering period. September—October, rarely August.

SOMERSET WEST. Lower W. slopes of Sir Lowrys Pass, *Lewis* 5731 (NBG).

CALEDON. Hottentots Holland Mts., *Hutchinson* 481 (BOL, K, PRE); *Pappe* (BM, K); *Phillips* (SAM); *Esterhuysen* 9123 (BOL); *Stokoe* (SAM 60172); Sir Lowrys Pass, *Bolus* 7850 (BOL, K); *MacOwan* HNAA 1788 (BOL, G, SAM, UPS, Z); *Werdermann* and *Oberdieck* 187 (B, PRE); Steenbras Siding, *Stokoe* (SAM 58000); slopes W. of Kogelberg, *Esterhuysen* 23142 (BOL); Elgin, *Barker* 2012 (NBG); *Cohen* (NBG); Highlands, *Henderson* 1110 (NBG); *Leighton* 284 (BOL); between Viljoens Pass and French Hoek Pass, *Stokoe* (SAM 60171); Houwhoek Pass, *Story* 3057 (PRE); Palmietrivier, *Penther* 586 (M, Z); Klein River Mts., *Zeyher* 4010 (K).

PAARL. Wemmershoek Mts., *Wasserfall* 482 (NBG); same, 3,000—4,000 ft., *Esterhuysen* 9060 (BOL); near Wemmershoek, 2,000 ft., *Phillips* 1313 (SAM); French Hoek Pass, 2,200 ft., *Barker* 4141 (NBG); *Strey* (M); French Hoek Forest Reserve, *Lewis* (BOL).

Without Locality. *Stanger* (K); *Prior* (K); *Jameson* (K).

This variety usually flowers a month or two later than var. *micrandra* but the flowering period of both is somewhat variable. The vegetative parts and general appearance are the same but they can readily be distinguished by the differences in the stamens and style branches.

Var. **confusa** Lewis var. nov. (Fig. 7 A). *I. polystachia* sensu Ker, Bot. Mag. t. 629. 1803; non L. 1762. *Watsonia retusa* Klatt, Abh. Naturf. Ges. Halle 12: 354 et Erganz. 20. 1882; Baker, Handbk. Irid. 178. 1892 et Fl. Cap. 6: 105. 1896; Dur & Schinz, Consp. Fl. Afr. 5: 195. 1895.

A var. *micrandra* foliis planis plerumque latioribus, filamentis paulo longioribus, antheris suborbicularibus vel late oblongis thecis non ad apicem extremum dehiscentibus, ramis styli brevioribus recurvis interdum minute bifidis, differt.

Cormus var. *micrandrae* similis sed interdum fibris non in collo pro-

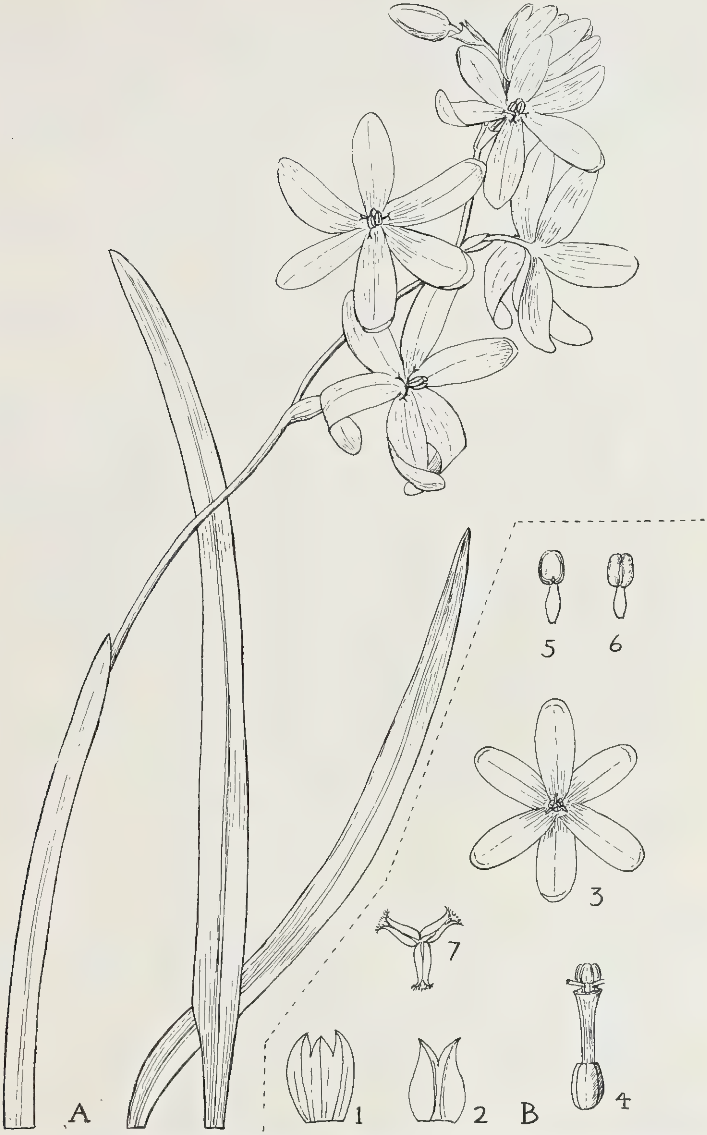


Fig. 7.—A. *I. micrandra* var. *confusa.* Copied from Bot. Mag. t. 629 (*I. polystachia* sensu Ker). B. *I. micrandra* var. *minor.* *Lewis* No. 5731. 1. Bract × 2. 2. Bracteoles × 2. 3. Flower. 4. Flower, side view, perianth lobes removed, × 2. 5. Stamen, front view, × 3. 6. Stamen, back view, × 3. 7. Style branches from above × 5. Del. G. J. Lewis.

ductis. *Folia* 2—4, breviter vel longe vaginantia, lamina lineari vel lanceolata 1—6 mm. lata, molli vel subrobusta, interdum marginibus et nervo medio leviter prominentibus. *Caulis, spica, bractea* var. *micrandrae* similes. *Flores* rosei vel lilacino-rosei, interdum ad medium macula parva rubella notati; *perianthii tubus* 3—4 mm. longus; *segmenta* oblonga vel obovato-oblonga obtusa, 1—1·7 cm. longa, 5—7 mm. lata. *Filamenta* 1·5—2 mm. longa; antherae suborbiculares vel late oblongae, 2—3 mm. longae, thecis non ad apicem extremum dehiscentibus. *Stylus* ad apicem tubi perianthii attingens, ramis involuto-cylindricis falcatis vel recurvis, circa 1·5 mm. longis, interdum minute bifidis.

Differs from var. *micrandra* in having flat, usually wider leaves, slightly longer filaments with suborbicular or broadly oblong anthers opening by a narrow slit extending nearly to the apex, and shorter recurved style branches sometimes minutely bifid.

Corm as in var. *micrandra* but sometimes without a neck of fibres. *Leaves* 2—4, with a fairly short to long sheath and linear or lanceolate blade 1—6 mm. wide, soft or moderately firm, the margins and mid-rib sometimes slightly prominent. *Stem, spike* and *bract* as in var. *micrandra. Flowers* pale to deep pink or mauve-pink, sometimes with a small reddish mark in the middle; *perianth tube* 3—4 mm. long; *lobes* oblong or obovate-oblong, obtuse, 1—1·7 cm. long, 5—7 mm. wide. *Filaments* 1·5—2 mm. long; anthers suborbicular or broadly oblong, 2—3 mm. long, the cells opening by a narrow slit extending nearly to the apex. *Style* reaching to top of perianth tube, the branches involute-cylindrical, falcate or recurved, about 1·5 mm. long, sometimes minutely bifid.

HOLOTYPE. *Compton* 18481 in the Compton Herbarium, Kirstenbosch.

Hills and mountain slopes from 700 to 5,000 ft.

Flowering period. Mostly September—November, sometimes August and at high altitudes November—December.

WORCESTER. Stettynsberg, *Esterhuysen* 15590 (BOL, NBG, PRE); *Stokoe* (SAM 60174).

BREDASDORP. Near Elim, *Smith* 3182 (PRE).

SWELLENDAM. Hill below Crown Mt., 700 ft., *Wurts* 301 (NBG); Swellendam, *Fry* in Herb. Galpin 4996 (PRE).

MONTAGU. Donkerkloof, 2,500 ft., *Compton* 18481 (BOL, NBG); *Lewis* 1499 (SAM); Langeberg, near Montagu, *Esterhuysen* 23833 (BOL).

RIVERSDALE. Garcias Pass, 1,200 ft., *Thorne* (SAM 41609).

GEORGE. Montagu Pass, *Marloth* 2429 (PRE).

OUDTSHOORN. Meiringspoort, *Esterhuysen* 24880 (BOL).

OUDTSHOORN—PRINCE ALBERT. Swartberg Pass, c. 5,000 ft., *Bolus* (BOL 12336); *Stokoe* (SAM 55754, 58724, 63516); *Hafström* and *Acocks* 311 (PRE, S); *Werdermann* and *Oberdieck* 843 (B, PRE).

The plant figured as *I. polystachia* on plate 629 of the Botanical Magazine has been the source of considerable confusion due to a series of misidentifications. Ker identified it with *I. polystachya* Jacq. Ic. t. 275—not *I. polystachya* L. which he placed as a synonym of *I. erecta* Berg. under plate 623 of the Botanical Magazine—though he observed that the flowers of his specimen were unusually large and the stem simple.

On comparing the Botanical Magazine figure with Jacquin's illustration and with the large amount of herbarium material now available, I have found that the plants depicted belong to two different species. Among the collections from the Worcester and Montagu Divisions cited above are some plants with wide leaves which almost exactly match the Botanical Magazine figure, the only significant difference being that the style branches are very slightly bifid instead of conspicuously so as shown in the figure, but as Ker remarked in the description that "the hiant stigmas should be observed with a glass", there is no doubt that this feature was exaggerated by the artist. In the collections cited above the leaves vary from 1 to 6 mm. in width, but apart from the flat, usually wider and sometimes more numerous leaves, and the slight differences in the floral characters recorded above, there is little to distinguish some of the forms from *I. micrandra* and I consider that they cannot be regarded as other than a somewhat variable variety.

The plant figured by Jacquin represents a different species, *I. stricta* (Klatt) Lewis, which differs in having a stiff erect branched stem, firm erect leaves with prominent stramineous veins, and considerably smaller flowers. Several collections exactly match Jacquin's figure, among them *Zeyher* 4008, cited by Klatt under *Tritonixia stricta* Klatt, and specimens distributed as *Agretta stricta* Eckl., a *nomen nudum.* Under *Tritonixia stricta* Klatt cited Jacquin's plate and also Botanical Magazine t. 629, but in the same work he described the plant figured in the Botanical Magazine as *Watsonia retusa* Klatt, probably intending it to be a new combination though this is not certain as he did not refer to *Ixia retusa* Salisb., which Ker had cited in the synonymy.

Baker added to the confusion about the identity of these plants by his treatment of them in the sixth volume of the Flora Capensis. He upheld *Watsonia retusa* Klatt (p. 105) but stated that it was known only from the figure cited and that the habit was so entirely that of an *Ixia* that he thought the style branches were drawn bifid by some mistake of the artist. However, on page 120 he listed both *I. polystachya* Jacq. Ic. t. 275, and *I. polystachia* Ker, Bot. Mag. t. 629, as synonyms of *Tritonia scillaris* (L.) Baker, and reduced *Tritonixia stricta* Klatt to a variety of that species, for which he gave only one synonym, *Agretta stricta* Eckl.

38. **I. crispa** L.f. Suppl. 91. 1781; Thunb. Diss. Ixia 9. t. 2. f. 3. 1783, Prod. 9. 1794 et Fl. Cap. ed. Schultes 57. 1823; Ker, Bot. Mag. t. 599. 1802; Red. Lil. t. 433. 1816. *Dichone crispa* (L.f.) Laws. ex Salisb., Trans. Hort. Soc. 1: 320. 1812. *Agretta crispa* (L.f.) Eckl. Top. Verz. 24. 1827, *nomen nud. Tritonia undulata* (Burm. f.) Baker, Journ. Linn. Soc. Bot. 16: 163. 1877, Handbk. Irid. 191. 1892 et Fl. Cap. 6: 121. 1896, as to plant described; Marloth, Fl. S. Afr. 4: 145. t. 42 b. 1915. *Tritonixia undulata* (Baker) Klatt, Abh. Naturf. Ges. Halle 12: 357 et Erganz. 23. 1882; Dur. & Schinz, Consp. Fl. Afr. 5: 209. 1895. *Tritonia thunbergii* N. E. Br., Kew Bull. 1929. 137; Foster, Contrib. Gray Herb. No. 114: 46. 1936.

Corm ovoid, 0·7—1 cm. diam., often caespitose; tunics of fine matted fibres extending up in a neck 0·5—3 cm. long. *Stem* slender, flexuose, 12—30 cm. high, nearly always simple. *Leaves* 4—6, linear or lanceolate, the margins crisped or undulated more or less to the mid-rib, 5—12 cm. long, 2—5 mm. wide. *Spike* laxly 2—10-flowered, the rachis usually flexuose. *Bract* ovate, trifid, tricuspidate or tridentate, 2—4 mm. long, pellucid, usually colourless below and purplish towards the apex; *bracteoles* bifid. *Flowers* actinomorphic, small, pink, usually with a narrow reddish ring outlining a small green stain in the middle; *perianth tube* filiform, 2—3 mm. long; *lobes* patent, slightly concave, equal, oblong or obovate-oblong, obtuse or subretuse, 0·8—1·1 cm. long, 4—6 mm. wide. *Stamens* arising at top of perianth tube, symmetrically disposed; filaments 2—3 mm. long; anthers subdidymous, ovate-oblong to orbicular, about 2 mm. long, the cells obtuse at the apex, recurved and acute at the base, opening by a narrow slit extending nearly to the apex. *Ovary* rotund, 2 mm. long; style reaching to top of perianth tube, the branches slender, cylindrical, slightly expanded at the apex, falcate or recurved, 1·5—2 mm. long.

HOLOTYPE. *Thunberg* 313 (sheet 58·10) in the Linnaean Herbarium.

Stony clay flats and hill slopes in the south-western districts of the Cape Province.

Flowering period. August—September.

PIKETBERG. Versveld Pass, *Thomas* (NBG); Piketberg, *Guthrie* 2733 (NBG); Piketberg road, *MacOwan* HNAA 1545 (G, K).

TULBAGH. *Schlechter* 1400 (BM, G, K); *Esterhuysen* 17474 (BOL); Roodesand, *Thunberg* (UPS); Tulbagh Kloof, *Ecklon* and *Zeyher* 244 (G, SAM); near Artois, *Bolus* (BOL 26898).

WORCESTER. *Zeyher* (K).

MALMESBURY. Near Malmesbury, *MacOwan* HNAA 1545 (K, SAM).

WELLINGTON. Near Wellington, *Grant* 2383 (BOL); near Huguenot Station, *Lewis* 1500 (SAM).

PAARL. Berg River near Paarl, *Drege* 1557 (P); between Paarl and

Klein Drakenstein Mts., *Drege* (K, P); Paarl, *Loubser* 469 (NBG); *Ecklon* 10 (BM, G, M, K); Daljosaphat, *Middlemost*, NBG 1364/37 (NBG).

SOMERSET WEST. Hottentots Holland, *Ecklon* and *Zeyher* (SAM).

P. CALEDON. *Prior* (K); *Matthews*, NBG 262/13 (BOL); Bot River, *Pillans* 1142 (BOL); Villiersdorp, *Grey* (K).

WITHOUT LOCALITY. *Thunberg* 313 (LINN); *Thunberg* (G, UPS—*I. crispa* sheet a); *Drege* (BM, G); *Thom* (K); *Oldenburg* 937 (BM); *Bowie* 13 (BM).

The locality given for *Bowie* 13 is "near Wynberg" but it is doubtful if this is correct.

This species was the only one placed in the undefined genus *Dichone* by Salisbury and was therefore the type of *Tritonia* subgenus *Dichone* as defined by Baker, and remains the type of the subgenus on its transfer from *Tritonia* to *Ixia*. Like many species of *Ixia* it was involved in a misidentification which, in this case, led to two changes in the specific epithet, but on its transfer back to the genus *Ixia* it reverts to the original name, *I. crispa*, L.f.

In 1802 it was figured as *I. crispa* in the Botanical Magazine, t. 599, where Ker cited *I. undulata* Burm. f. as a synonym, and seventy-five years later, when Baker removed it to *Tritonia*, he adopted Burmann's epithet as the name *Tritonia crispa* was already used for another species. It is obvious that neither Ker nor Baker saw the type of *Ixia undulata* in Burmann's herbarium as the plant is so entirely different that they could not have identified it with *I. crispa*. The mistake was pointed out by Dr. N. E. Brown in 1929 in his paper on the Iridaceae of Burmann's Florae Capensis Prodromus (Kew Bull. 1929, p. 137), in which he retained the name *Tritonia undulata* for Burmann's plant, giving a detailed description of it, and renamed the Linnaean plant *T. thunbergii*. Some amendments to the nomenclature were made by Dr. Foster in 1936 (Contrib. Gray Herb. No. 114, 46).

39. **I. stricta** (Eckl. ex Klatt) Lewis comb. nov. *Tritonixia stricta* Eckl. ex Klatt, Abh. Naturf. Ges. Halle 12: 357 et Erganz. 23. 1882, excl. syn. *Ixia polystachia* Red.; Dur. & Schinz, Consp. Fl. Afr. 5: 209. 1895. *Agretta stricta* Eckl. Top. Verz. 23. 1827, *nomen nud. Ixia polystachya* sensu Jacq. Ic. t. 275. 1786—93 et Coll. 3: 269. 1789; non L. 1762. *I. polystachia* var. *incarnata* Andr. Bot. Rep. t. 128. 1801. *I. scillaris* L. var. *angustifolia* Ker, Bot. Mag. sub. t. 542. 1801. *Tritonia scillaris* Baker, Journ. Linn. Soc. Bot. 16: 163. 1877, pro parte. *T. scillaris* var. *stricta* (Klatt) Baker, Handbk. Irid. 191. 1892 et Fl. Cap. 6: 120. 1896. ? *Ixia retusa* Salisb. Prodr. 35. 1796.

Corm ovoid or subglobose, 1—2 cm. diam.; tunics of coarse vertical confluent fibres, slightly comose at the apex. *Stem* slender, 35—55 cm. high, simple or with 1—3 short suberect more or less flexuose branches. *Basal sheaths* 2, acute, 2—8 cm. long, the upper usually brown. *Leaves* 3—4, erect, lanceolate, firm or somewhat rigid with thickened stramineous margins and mid-rib, 12—35 cm. long, 3—9 mm. wide, often brown and spirally twisted towards the apex at flowering time. *Spike* fairly laxly 6—16-flowered, the rachis usually flexuose. *Bract* small, oblong or obovate, subtruncate, obtuse, acute or shortly tridentate, 3—5 mm. long, pellucid, colourless or the upper half sometimes purplish; *bracteoles* slightly shorter than bract, bicarinate, bidentate. *Flowers* actinomorphic, small, pale to deep pink with a small darker pink star in the middle; *perianth tube* filiform, 5 mm. long; *lobes* patent, obovate or oblong, obtuse or retuse, 0·7—1 cm. long, 3—5 mm. wide. *Stamens* arising at top of perianth tube, erect, symmetrically arranged; filaments 1·5—2 mm. long; anthers broadly oblong, about 2 mm. long, subdidymous, the cells obtuse at base and apex, opening by a narrow slit extending nearly to the apex. *Ovary* rotund, about 2 mm. long; style reaching to top of perianth tube, the branches involute-cylindrical, 1·5—2 mm. long, falcate or recurved, minutely bifid and ciliate at the apex.

LECTOTYPE. *Zeyher* 4008 in the South African Museum Herbarium, National Botanic Gardens, Kirstenbosch.

Hills and mountain slopes in the Caledon and Bredasdorp Divisions.

Flowering period. November—December.

CALEDON. Swartberg, *Zeyher* 4008 (K, SAM); *Pappe* (BOL); Houwhoek, *Schlechter* 9411 (BM, BOL, G, K); *Guthrie* 3580 (NBG); Elgin district, *Elbrecht* (PRE); Sondags Kloof, *Compton* 10258 (NBG); Kleinmond, *Taylor* 3778 (NBG).

BREDASDORP. Near Napier, *Salter* 4151 (BOL, K); Elim, *Barker* 7774 (NBG); Bredasdorp, mountain slopes, *Galpin* (PRE 10463).

As the type of *Tritonixia stricta*, *Zeyher* 4008 in Herb. Lubeck, Berlin-Dahlem Herbarium, is presumed to have been destroyed during the last war, a specimen of Zeyher's with the same number in the South African Museum Herbarium has been selected as the lectotype. It is named *Agretta stricta* Eckl. by Zeyher, agrees with Klatt's description, and is almost certainly an isotype.

Ixia retusa Salisb. has been placed with a query in the synonymy as I have not seen any specimen so named by Salisbury and the brief description leaves some doubt as to the identity of his plant. If the type has been preserved and proves to be this species then his name should be used for it.

In a note under *I. micrandra* var. *confusa* I have already mentioned that Ker identified *I. retusa* Salisb. with the plant figured as *I. polystachia* on plate 629 of the Botanical Magazine (i.e. *I. polystachia* Ker, not of Linnaeus) and that Klatt later described the plant figured as *Watsonia retusa*, while in the same work he cited *Ixia scillaris* var. *angustifolia* Ker, Bot. Mag. sub. t. 542 and Bot. Mag. t. 629 in the synonymy under *Tritonixia stricta*. The latter should be omitted from the synonymy since I consider that the Botanical Magazine plate represents a form of *I. micrandra* var. *confusa* Lewis, whereas the plant figured by Jacquin as *I. polystachya* (Ic. t. 275), with which Ker identified it, represents the species described above as *I. stricta*, and the collections cited above match Jacquin's figure. Klatt's reference to *I. polystachia* Red. Lil. t. 126 must also be excluded as this plant is *I. flexuosa* L.

40. **I. trinervata** (Baker) Lewis comb. nov. *Tritonia trinervata* Baker, Handbk. Irid. 191. 1892 et Fl. Cap. 6: 121. 1896; Dur. & Schinz, Consp. Fl. Afr. 5: 208. 1895.

Corm subglobose, 1—1·5 cm. diam.; tunics of fairly fine to moderately coarse vertical confluent fibres, somewhat comose at the apex. *Stem* slender, simple, 20—40 cm. high. *Basal sheaths* 2, firm, usually long, the upper sometimes green at the apex. *Leaves* 2, firm, usually with 3 more or less prominent stramineous veins, the lower leaf 12—24 cm. long with the lower third to half sheathing and a subarcuate or suberect lanceolate blade 0·4—1 cm. wide, the upper leaf almost entirely sheathing, varying from shorter to longer than the lower. *Spike* 3—12-flowered, short and compact to fairly long and lax. *Bract* ovate, subtruncate, obtuse or tridentate, 4—5 mm. long, pellucid, pale to deep mauve-pink or purplish, usually with 3 to several veins; *bracteoles* bicarinate, bidentate or bicuspidate. *Flowers* actinomorphic, bright pink or deep mauve-pink; perianth tube filiform, 4—6 mm. long; *lobes* patent, equal, oblong, obtuse or retuse, 1·2—1·5 cm. long, 5—8 mm. wide. *Stamens* arising at top of perianth tube, erect, symmetrically disposed; filaments 2—3 mm. long; anthers broadly oblong or suborbicular, subdidymous, 2—2·5 mm. long, the cells obtuse at base and apex, opening by a narrow slit extending nearly to the apex. *Ovary* rotund, about 2 mm. long; style reaching to top of perianth tube, the branches involute-cylindrical, falcate or recurved, about 4 mm. long, slightly expanded at the apex and sometimes very shortly bifid.

HOLOTYPE. *Ecklon* and *Zeyher* 242 in Kew Herbarium.

Hills and mountain slopes in the Caledon Division.

Flowering period. September.

CALEDON. Lebanon Forest Reserve, Elgin, *Lewis* 4178 (SAM); *Martin* 1043 (NBG); Elgin, *Linley* (SAM); Caledon Commonage, *Barker* 143 (BOL); Caledon, near Mission, *Matthews* (BOL 26872); Appels Kraal, River Sonderend, *Ecklon* and *Zeyher* 242 (G, K, Z).

This species is very near *I. stricta* from which it differs in having only two leaves, the lower usually half sheathing with a short subfalcate blade, and larger flowers with longer style branches. It flowers in the spring and *I. stricta* in the summer.

41. **I. brevituba** Lewis sp. nov.

Cormus subglobosus, circa 2 cm. diam., tunicis e fibris subrobustis in collo 10—13 cm. longo productis, compositis. *Caulis* gracilis rectus, 35—50 cm. altus, ramis brevibus 1—2. *Folia* 4—5, linearia vel lineari-lanceolata subfalcata vel erecta, 18—45 cm. longa, 1·5—4 mm. lata, firma, marginibus et nervo medio et 1—2 alteris subprominentibus. *Spica* sat laxe 5—10-flora, rachide plerumque flexuoso. *Bractea* oblonga acuta, 7—9 mm. longa, pellucida vel sine colore vel ex parte purpurina, nervis fuscis 1 vel 3; *bracteolae* quam bractea aequilongae, bicarinatae bidentatae. *Flores* regulares subcaerulei vel lilacino-caerulei cyaneo suffusi: *perianthii tubus* brevissimus cylindricus, 1—1·5 cm. longus, in bractea inclusus; *segmenta* aequalia, oblonga vel obovato-oblonga obtusa, circa 1—1·2 cm. longa, 5—7 mm. lata. *Stamina* ad apicem tubi perianthii orta, congruenter disposita, filamentis 2 mm. longis et antheris oblongis 5 mm. longis per margines a fundo ad apicem late dehiscentibus. *Ovarium* rotundum, circa 2 mm. longum; stylus ad apicem tubi perianthii attingens, ramis involuto-filiformibus circa 3 mm. longis apice stigmatifero.

Corm subglobose, about 2 cm. diam.; tunics of moderately coarse fibres extending up in a neck 10—13 cm. long. *Stem* slender, straight, 35—50 cm. high, with 1—2 short branches. *Leaves* 4—5, linear or linear-lanceolate, subfalcate or erect, 18—45 cm. long, 1·5—4 mm. wide, firm with the margins, mid-rib and 1 or 2 other veins slightly prominent. *Spike* fairly laxly 5—10-flowered, the rachis usually flexuose. *Bract* oblong, acute, 7—9 mm. long, pellucid, colourless or partly purplish, with 1 or 3 dark veins; *bracteoles* as long as bract, bicarinate, bidentate. *Flowers* actinomorphic, pale blue or violet-blue tinged with darker blue; *perianth tube* very short, cylindrical, 1—1·5 mm. long, included in bract; *lobes* equal, oblong or obovate-oblong, obtuse, about 1—1·2 cm. long, 5—7 mm. wide. *Stamens* arising at top of perianth tube, erect, symmetrically disposed; filaments 2 mm. long; anthers oblong, 5 mm. long, opening widely from base to apex along the sides. *Ovary* rotund, about 2 mm. long; style reaching to top of perianth tube, the branches involute-filiform, about 3 mm. long, stigmatic at the apex.

HOLOTYPE. *Grant* and *Theiler* 4931 in the Bolus Herbarium.

Flowering period. September—October.

SUTHERLAND. Near Quaggas Pass on road from Middlepost to Ceres, *Grant* and *Theiler* 4931 (BOL); Komsberg, flats, *Marloth* 9782 b (PRE).

The description has been drawn from the only two known collections of this very distinct species. It is most closely allied to *I. trifolia* but distinguished by the taller, more slender stem, longer narrower leaves and blue flowers with a very short perianth tube which is not more than 1·5 mm. long and is the shortest in the genus.

42. **I. trifolia** Lewis, Fl. Pl. S. Afr. 14: t. 543. 1934.

Corm ovoid or globose, 1·5—2 cm. diam.; tunics matted, of coarse somewhat ligneous fibres, the lower half of parallel vertical strands and upper half reticulate. *Stem* 15—30 cm. high, simple or with 1—2 short branches. *Basal sheaths* 2, 0·5—4·5 cm. long. *Leaves* 3 or 4, lanceolate, firm with more or less prominent cartilaginous margins and mid-rib, 6—16 cm. long, 0·6—1 cm. wide, the lowest usually falcate and others erect, arcuate or straight, the uppermost almost entirely sheathing. *Spike* laxly 5—9-flowered, the rachis flexuose. *Bract* ovate, obtuse, truncate or very shortly tridentate, 7—9 mm. long, pellucid, green at the base and pinkish mauve above; *bracteoles* bicarinate, bidentate. *Flowers* actinomorphic, deep pink or purplish pink, usually with a small inconspicuous purple stain in the middle; *perianth tube* filiform, 3—4 mm. long, not exserted from the bract; *lobes* connate for about 1 mm., oblong or obovate-oblong, obtuse, 1·4—2 cm. long, 0·7—1 cm. wide, patent. *Stamens* arising at top of perianth tube, symmetrically disposed; filaments 4—5 mm. long, occasionally connate at the base, purple; anthers yellow, 4—5 mm. long, linear-oblong, opening widely from base to apex along the sides. *Ovary* rotund, 2—3 mm. long; style reaching to base of anthers or shortly above, the branches 4—5 mm. long, filiform, straight or slightly curved, minutely ciliate and stigmatic at the apex.

HOLOTYPE. *Lewis*, NBG 2706/32 in the Bolus Herbarium.

Flats and hills in western mountain karoo vegetation.

Flowering period. September—October.

SUTHERLAND. Between Matjesfontein and Sutherland, *Hutchinson* 685 (BOL, K); top of Verlaten Kloof, Jakhals Valley, *Marloth* 9646 (PRE); Theronsrust, S. of Sutherland, c. 5,300 ft., *Acocks* 17798 (PRE).

LAINGSBURG. Tweedside, *Lewis*, NBG 2706/32 (BOL, K, PRE).

43. **I. curvata** Lewis sp. nov.

Cormus ovoideus vel subglobosus, 1·3—2·3 cm. diam., tunicis e fibris subrobustis reticulatis plerumque in collo 3—5 cm. longo productis, compositis. *Caulis* gracilis, firmus, plerumque valde flexuosus vel curvus, 15—25 cm. altus, simplex vel ramis 1—2 brevibus flexuosis. *Vaginae basales* 2, acutae, 3·5—7 cm. longae, aurantiaco-brunneae. *Folia* 3—5, linearia arcuata, 7—13 cm. longa, 2—4 mm. lata, firma vel subrigida nervo medio prominenti. *Spica* laxe 6—10-flora plerumque rachide flexuoso. *Bractea* oblonga vel oblongo-ovata obtusa vel acuta vel tridentata, 4—5 mm. longa, pellucida vel sine colore vel purpurina plerumque nervis fuscis 1 vel 3; *bracteolae* quam bractea aequilongae, bicarinatae bidentatae. *Flores* plerumque regulares, parvi rosei; *perianthii tubus* filiformis, 3—5 mm. longus; *segmenta* patentia oblonga obtusa subaequalia, 0·9—1·4 cm. longa, 4—8 mm. lata. *Stamina* ad apicem tubi perianthii orta, erecta, congruenter disposita, interdum postea aliquanto filamentis curvis et antheris reclinatis; filamenta 3—4 mm. longa; antherae oblongae subdidymae, 3·5—4 mm. longae, thecis apice obtusis, basin versus recurvis obtusis vel subacutis, a fundo ad apicem late dehiscentibus. *Ovarium* rotundum, circa 3 mm. longum; stylus fere ad medium filamentorum attingens, ramis involuto-cylindricis, falcatis vel recurvis, 2—3 mm. longis, retusis vel brevissime bifidis apice stigmatifero minute papillato.

Corm ovoid or subglobose, 1·3—2·3 cm. diam.; tunics of moderately coarse reticulate fibres, usually extending up in a neck 3—5 cm. long. *Stem* slender, firm, usually extremely flexuose or curved, 15—25 cm. high, simple or with 1—2 short flexuose branches. *Basal sheaths* 2, acute, 3·5—7 cm. long, orange-brown. *Leaves* 3—5, linear, arcuate, 7—13 cm. long, 2—4 mm. wide, firm or fairly rigid with the mid-rib prominent. *Spike* laxly 6—10-flowered, the rachis usually flexuose. *Bract* oblong or oblong-ovate, obtuse, acute or tridentate, 4—5 mm. long, pellucid, colourless or purplish, usually with 1 or 3 dark veins; *bracteoles* as long as bract, bicarinate, bidentate. *Flowers* usually actinomorphic, small, deep pink; *perianth tube* filiform, 3—5 mm. long; *lobes* patent, oblong, obtuse, subequal, 0·9—1·4 cm. long, 4—8 mm. wide. *Stamens* arising at top of perianth tube, erect, symmetrically disposed but sometimes the filaments becoming curved and anthers reclinate later; filaments 3—4 mm. long; anthers oblong, subdidymous, 3·5—4 mm. long, the cells obtuse at the apex and recurved and obtuse or subacute at the base, opening widely from base to apex. *Ovary* rotund, about 3 mm. long; style reaching nearly to middle of filaments, the branches involute-cylindrical, falcate or recurved, 2—3 mm. long, retuse or very shortly bifid and minutely papillate at the apex.

HOLOTYPE. *Lewis* 2532 in the South African Museum Herbarium, National Botanic Gardens, Kirstenbosch.

Hills and low slopes of mountains at 3,000—3,400 ft. altitude in the Calvinia Division.

Flowering period. September.

CALVINIA. Moordenaarspoort, near Agter Hantamsberg, 26—28 miles N.E. of Calvinia, *Lewis* 2532 (SAM); *Middlemost* 1778 (NBG);

4½ miles S.S.E. of Calvinia, *Acocks* 18504 (PRE); Akkerdam, slopes of Hantamsberg, *Acocks* 17718 (NBG, PRE).

This species is distinguished from *I. trifolia*, to which it is closely allied, by its more curved and flexuose stem, usually more numerous, narrower and strongly falcate leaves, shorter bracts and smaller flowers with shorter, broader and more curved style branches. The corm, with its fibrous neck, and the bright orange-brown basal leaf-sheaths, also serve to distinguish this species.

44. **I. scillaris** L. Sp. Pl. ed. 2. 1: 52. 1762; Burm. f. Prod. 1. 1768; Houtt. Nat. Hist. 12: t. 77. f. 2. 1780; Panzer, Pflanzensyst. 11: t. 77. f. 2. 1784; Red. Lil. t. 127. 1807. *I. scillaris* var. *latifolia* Ker, Bot. Mag. t. 542. 1801; DC. in Red. Lil. sub t. 127. *I. pentandra* L.f. Suppl. 92. 1781; Thunb. Diss. Ixia 18. 1783, Prod. 10. 1794 et Fl. Cap. ed. Schultes 63. 1823. *I. polystachya* var. Jacq. Coll. Suppl. 159. t. 2. f. 1. 1796. *I. reflexa* Andr. Bot. Rep. t. 14. 1798. *I. rotata* (Ker) Andr. Recens. 3. 1801. *Tritonia scillaris* (L.) Baker, Journ. Linn. Soc. Bot. 16: 163. 1877, Handbk. Irid. 191. 1892 et Fl. Cap. 6: 120. 1896; Lewis in Adamson & Salter Fl. Cap. Pen. 249. 1950. *Tritonixia scillaris* (L.) Klatt, Abh. Naturf. Ges. Halle 12: 357 et Erganz. 23. 1882; Dur. & Schinz, Consp. Fl. Afr. 5: 209. 1895. *Agretta pentandra* (L.) Eckl. Top. Verz. 23. 1827, *nomen nud. Hesperantha pentandra* Drege in herb. ex Baker, Journ. Linn. Soc. Bot. 16: 163.

Corm ovoid or subglobose, 1—2 cm. diam.; tunics of fairly coarse vertical confluent fibres, comose at the apex. *Stem* firm, usually moderately stout, straight or flexuose, 20—50 cm. high, 1—3 mm. diam., simple or with 1—3 long erect branches. *Basal sheaths* 1 or 2, colourless or brown at the apex, acute, 1·5—7 cm. long. *Leaves* 3—7, distichous, lanceolate or ensiform, subobtuse, acute or acuminate, the lowest often more or less falcate and others erect or suberect and straight or almost so, 7—25 cm. long, 0·5 —2·5 cm. wide (usually 1—2 cm.), firm and conspicuously 3-veined or softer in texture and not very conspicuously 4- or 5-veined. *Spike* long, laxly 7—25-flowered, the lower flowers up to 2 or even 3 cm. apart, the rachis straight or flexuose. *Bract* small, pellucid, colourless, pale pink or purplish, obovate, 3- or 5-dentate or cuspidate, 4—5 mm. long; *bracteoles* bicarinate, bicuspidate. *Flowers* slightly zygomorphic, pale to deep pink or magenta, occasionally white or mauve, usually with a small greenish stain in the middle, faintly fragrant; *perianth tube* filiform, 3—4 mm. long; *lobes* patent or reflexed, more or less equally disposed or the 3 upper closely placed with partly overlapping margins and 3 lower separated, equal or 3 inner 1—2 mm. wider than outer, oblong or obovate-oblong, slightly concave, sometimes subunguiculate, 0·8—1·6 cm. long, 5—8 mm. wide. *Stamens* arising at top of perianth tube; filaments flat, 3—4 mm. long, the 2 lower slightly twisted and sometimes directed towards the upper; anthers oblong, subdidymous, 3—4 mm. long, lightly attached near the base, reclinate and pendulous, not symmetrically disposed, sometimes more or less connivent at the base, extrorse, the cells obtuse at the apex, slightly recurved and acute at the base, opening by a narrow slit extending nearly to the apex. *Ovary* oblong-trigonal with rounded angles, about 2·5 mm. long; style reaching to top of perianth tube, the branches 2·5—3 mm. long, involute-cylindrical, slightly expanded and minutely papillate at the apex, recurved.

LECTOTYPE. Sheet 58·25 in the Linnaean Herbarium.

Clay or sandy soil on hills and mountain slopes up to 3,000 ft. in the coastal districts from Namaqualand to the Cape and in the Paarl, Somerset West and Caledon Divisions.

Flowering period. August—November.

NAMAQUALAND. Spektakel, *Esterhuysen* 5853 (BOL); *Barker* 1328 (NBG); 14 miles W. by S. of Springbok, *Acocks* 19439 (NBG, PRE); 10 miles W. of Springbok, *Barker* 6660 (NBG).

VANRHYNSDORP. Gifberg, *Barker* 9578 (NBG).

CLANWILLIAM. Olifants River Valley, *Steyn* 378, 516 (NBG); *Barker* 5758 (NBG); *Compton* 22769 (NBG); Clanwilliam, *Leipoldt* 221 (BOL, SAM); Elands Kloof, *Lewis* 1351 (SAM); *Leighton* 1254 (BOL); Brakfontein, *Ecklon* and *Zeyher* 243 (G, SAM); Citrusdal, *Barker* 3765 (NBG); 15—20 miles N. of Citrusdal, *Lewis* 1352 (SAM), 5233 (NBG); between Greys Pass and Clanwilliam, *Leipoldt* 3833 (BOL); Olifants River Mts., *Howes* 204 (K); *Schlechter* 5076 (Z); *Stokoe* (SAM); Olifants River Valley, Warm Baths to Modderfontein, *Stephens* 7087 (BM, K); Pakhuis, *Bolus* 9098 (BOL); *Esterhuysen* 3158 (BOL); *Lewis* (BOL); *Galpin* 11115 (K); *MacOwan* 3301 (SAM); *Leipoldt* 797 (SAM); *Bond* 614 (NBG); *Compton* 19962 (NBG); 10 miles N. of Clanwilliam, *Leighton* 1099 (BOL); *Compton* 17115 (NBG); *Lewis* 1353 (SAM); Nardouw Kloof, *Stokoe* (SAM); 20 miles S. of Clanwilliam, *Salter* 7494 (SAM); Nieuwoudt Pass, *Leighton* (BOL); between Witte Els Kloof and Lamberts Hoek Mt., *Pillans* 9172 (BOL, SAM); Zeekoe Vlei, *Schlechter* 8500 (BM, G, K).

PIKETBERG. *Drege* 8497 (P); top of Greys Pass, *Taylor* 960 (BOL); Pikeniers Kloof, *Loubser* 911 (NBG); between Berg River Valley and Clanwilliam, *Lewis* 1848 (SAM); Het Kruis, *Stephens* and *Glover* 8605 (BM, K); Piketberg Mt., *Barker* 7584 (BOL, NBG); Kapiteins Kloof Mt., 3,250 ft., *Pillans* 7806 (BOL); hills N.W. of Moutons Vley, *Pillans* 7277 (BOL).

MALMESBURY. Near Groene Kloof, *Thunberg* (UPS—type of *I.*

pentandra); *Bolus* 4006 (BM, BOL, SAM); Klipberg, between Laauws Kloof (near Groene Kloof) and Saldanha Bay, *Drege* (K, P); near Malmesbury, *Schlechter* 1678 (Z).

CAPE. Little Lions Head, *Salter* 333/18 (BM); Kanonberg, *Salter* 1728 (K); near Camps Bay, *MacOwan* 2234 (SAM), HNAA 274 (BM, BOL, G, K); *Dod* 1776 (BM); *Zeyher* 5035 (BOL, SAM); *Pappe* (K); *Barker* 3214 (NBG); *Cassidy* 38, 54 (NBG); *Letty* 233 (K); between Kloof Nek and Camps Bay, *Lewis* 969 (SAM); above Bakoven, *Barker* 3220 (BOL, NBG); Sea Point, *Wilms* 3710 (BM, K); Lions Head, *Bolus* 2826 (BM, BOL, K); *Heginbotham* 108 (NBG); Signal Hill, *Dummer* 523 (BM); Table Mt., *Mudd* 10 (K); *Ecklon* 9 b (BM, K, M), 536 (K); *Garside* 270 (K); *Drege* (P, SAM); Devils Peak, *Dod* 487 (K); *Bolus* 4006 (BOL, K); Cape Town, *Prior* (K); Orange Kloof, *Dod* 3502 (BOL, K); Wynberg Flats, Bowie 11 (BM).

PAARL. Paarl Mt., *Drege* (K, P).

SOMERSET WEST. Sir Lowrys Pass, *Schlechter* 5370 (BM, BOL, G, K); *Compton* 16542 (BOL, NBG); Helderberg, *Parker* 4360 (BOL, NBG); Hottentots Holland, *Prior* (K).

CALEDON. Bot River Valley near Hawston, *Wilman* 768 (BOL).

WITHOUT LOCALITY. *Linnaeus* (LINN, sheet 58·25); *Burmann* (G); *Thunberg* (G); *Drege* (BM, G); *Jussieu* 3598 (P); *Lamarck* (P); *Percheron* 88 in Herb. Lamarck (P); *Burchell* (K); *Forsyth* (K); *Roxburg* (BM, G); *Pappe* (K, SAM); *Prior* (BM); *Bowie* 4 (BM); *Oldenburg* 570, 704 (BM); *Sparrman* (LINN).

There are two distinct forms of this species, merging into each other through intermediates. In the Clanwilliam, Piketberg and Caledon Divisions the plants are fairly tall and robust with a simple or branched stem up to 50 cm. high, three or four fairly firm, conspicuously three-nerved leaves, the lowest usually falcate, and a long lax spike with the lower flowers up to 2 or 3 cm. apart. A smaller more branched form occurs in the Piketberg, Malmesbury, Cape, Paarl and Somerset West Divisions. This usually flowers a few weeks later and has four to seven leaves, narrower, more acute, somewhat softer in texture and less conspicuously three- to five-veined, also a shorter spike with slightly smaller and more regular flowers, the lower ones not more than 1·5 cm. apart. Intermediates with three to five leaves, which cannot definitely be placed in one or the other of these forms, occur in Namaqualand and in the vicinity of Mamre and Darling in the Malmesbury Division, and some of the collections from the latter area exactly match the plant in the Linnaean Herbarium which is chosen as the lectotype of the species.

In the Linnaean Herbarium there are three sheets named *I. pentandra*, 58.25, 58.26 and 58.27—the first erroneously listed as *I. pectinata* by Mr.

Savage on page 7 of his Catalogue of the Linnaean Herbarium. On sheet 58.26 there is a flowerless plant of the smaller form, collected by Sparrman, and on sheet 58.27, marked "CBS. crescit in Belgio", the top of an inflorescence of the same form. Neither can be the type but the plant on sheet 58.25 agrees with the description, and as the name *I. scillaris* was written on the sheet by Linnaeus it is possible that it might have been the type. This name was deleted by the younger Linnaeus, who named it *I. pentandra*, but the original name was confirmed by J. E. Smith who added "*scillaris* Herb. B. & L. Sp. Pl." The plant is tall, with a simple, comparatively stout stem, an elongated lax spike, and five leaves, the lower ones ensiform and conspicuously three-veined.

Owing to some confusion, which research into the Linnaean correspondence and early history of the herbarium might elucidate, the younger Linnaeus applied the name *I. scillaris* to a species of *Geissorrhiza* with very narrow filiform, subquadrangular or subterete leaves, and described as a new species a specimen of *I. scillaris* collected by Thunberg, naming it *I. pentandra* on account of its unusual pentandrous flowers (the type is in Thunberg's Herbarium). Sheet 58.14 in the Linnaean Herbarium, which contains three specimens of *Geissorrhiza juncea* collected by Sparrman (no. 17), is named *Ixia scillaris* by Linnaeus f., with a note by J. E. Smith "Thunb. Diss. n. 14 nec Linn". According to Mr. Savage's Catalogue, p. 7, *Sparrman* No. 17 was named "*Ixia alba nutans*".

Due to the above misidentification by the younger Linnaeus, the plants in Thunberg's Herbarium named *I. scillaris*, and described by him under this name, are partly *Geissorrhiza juncea* and partly another species of *Geissorrhiza*, neither of which in any way agrees with the description of *I. scillaris* given by Linnaeus, nor resembles the specimen on sheet 58.25 in his herbarium.

Linnaeus gave the following brief description of the species in 1762: "*Ixia* foliis ensiformibus striatis, spica elongata. Flores violacei ut in *Scilla amoena*, antheris flavis, alterni, remoti." In 1767, in the Syst. Nat. 12, p. 75, he added the words "bulbus deorsum imbricatus". The references to the colour of the flowers and to the corm are puzzling as they do not seem to apply to *Ixia scillaris* L. With regard to the former, I can only think that Ker was right in supposing the plant to have been described from a dried specimen. The species was illustrated as *I. scillaris* var. *latifolia* in the Botanical Magazine in 1801, t. 542, where Ker commented on the colour as follows: "This is certainly Linnaeus's plant, and received its trivial name from a supposed resemblance to *Scilla amoena*, a proof that he described it from a dried subject, in which state it certainly affords different ideas of resemblance, than when seen in a living one, especially in colour, which then becomes nearly violet, but is distinct from the *I. scillaris* of Thunberg, that being nearly allied to *I. secunda*" (i. e. *Geissorrhiza*).

In *I. scillaris*, as in a few other species, the corm tunics are very often composed of imbricating layers of fairly coarse vertical confluent fibres, to which the description "bulbus deorsum imbricatus" might perhaps apply. There is no corm on the specimen in the Linnaean Herbarium.

The difference between *I. scillaris* and other species of the subgenus is discussed in the introduction to this paper, under the Subgenus Dichone.

Var. **subundulata** Lewis var. nov.

Plantae quam var. *scillaris* minores et graciliores, foliorum marginibus leviter vel perspicue undulatis.

Caulis simplex vel ramosus, gracilis vel subrobustus, 20—45 cm. altus. *Folia* 3—4, lanceolata vel ensiformia, 5—20 cm. longa, 0·3—1·5 cm. lata, subobtusa vel acuta, infimum plerumque falcatum, mollia, marginibus plus minusve undulatis et nervo medio subprominente. *Spica* laxe 5—20-flora. *Flores* albi vel rosei ad medium macula punicea notati, var. *scillare* similes.

Plants smaller and more slender than in var. *scillaris*, the leaves with slightly to distinctly undulate margins.

Stem simple or branched, slender to moderately stout, 20—45 cm. high. *Leaves* 3—4, lanceolate or ensiform, 5—20 cm. long, 0·3—1·5 cm. wide, subobtuse or acute, the lowest usually falcate, soft with more or less undulate margins and the mid-rib slightly prominent. *Spike* laxly 5—20-flowered. *Flowers* white to pink with a small deep pink stain in the middle, as in var. *scillaris*.

HOLOTYPE. *Barker* 4727 in the Compton Herbarium, Kirstenbosch.

Flats and lower slopes of mountains, usually in clay soil, in the Clanwilliam and Piketberg Divisions.

Flowering period. August—September.

CLANWILLIAM. Klipfonteinrand, *Barker* 4727 (BOL, NBG); Brandewyn Rivier, *Barker* 1327 (NBG); *Esterhuysen* 5805 (BOL); near Pakhuis on road to Wupperthal, *Leipoldt* (BOL 20775, K, SAM).

PIKETBERG. Foot of Piketberg Mt., *Schlechter* 5218 (BM, BOL, G, K, SAM); De Hoek, near Piketberg, *Barker* 2560, 5764 (NBG), 4671 (BOL, NBG); *Lewis* 1849 (SAM); Piketberg, *Guthrie* 2700 (NBG); Kapiteins Kloof, *Pillans* 7713 (BOL).

WITHOUT LOCALITY. *Jussieu* 3619 (P); *Thunberg* (UPS—*I. crispa* sheet b).

This variety has generally been confused with *I. crispa* but is distinguished by its wider, less undulate leaves and slightly zygomorphic flowers with patent or reflexed lobes and longer pendulous anthers.

Thunberg gave two localities for *I. crispa* in his Flora Capensis, Roodesand hills and near Piketberg. The first of the two sheets named *I. crispa* in his herbarium is the plant figured by him and the same as his No. 313 in the Linnaean Herbarium which is the type of *I. crispa* L. f., while the second is the variety of *I. scillaris* described above. The first he probably collected on the Roodesand hills in the Tulbagh Division, where *I. crispa* is known to occur. The second has been found on the lower southern slopes of the Piketberg Mt., in the same locality and flowering at the same time as *I. lancea* Thunb. (= *Tritonia lancea* (Thunb.) N. E. Br.), and was probably collected by Thunberg in this area.

SPECIES EXCLUDED

The following species have been excluded for various reasons, the majority owing to insufficient knowledge concerning them:

I. alba Eckl. Top. Verz. 27. 1827, *nomen nudum.* This is a later homonym of *I. alba* L. (= *Sparaxis* sp.). See note under *I. odorata* var. *hesperanthoides.*

I. ambigua Salisb. Prod. 39. 1796. No specimen has been seen but this is evidently a *Tritonia* as are the five previous species referred to in the description.

I. amoena Salisb. l. c. 35. No specimen has been seen and the species cannot be determined from the description. It has been cited as a synonym of *I. maculata.*

I. amoena Link. Enum. Pl. Hort. Berol. 1: 52. 1821. From the description it is very unlikely that *I. amoena* Link., a later homonym of *I. amoena* Salisb., is an *Ixia.* It is possibly *Tritonia rubro-lucens* Foster (syn. *T. rosea* Klatt).

I. antholyzaeformis Lam. Encyc. 3: 334. 1789 et Illustr. 1: 109. 1791. It is evident from the description that this is not an *Ixia.* There is no specimen in Lamarck's herbarium, only a rough drawing which I was unable to identify.

I. arcuata Burm. f. Prod. Fl. Cap. 2. 1768. There is no specimen in Burmann's herbarium and it is not possible to determine the species from the description.

I. azurea Grey, Hardy Bulbs 1: 283. 1937, *nomen illeg. Lapeyrousia azurea* Eckl., cited with a query by the author, is a large-flowered variety of *Lapeirousia corymbosa* (Fl. Cap. 6: 90), and cannot be the plant he described. The name is a later homonym of *Ixia azurea* Banks ex Ker, Bot. Mag. t. 598.

I. bicolorata Klatt, Abh. Naturf. Ges. Halle 12: 396 et Erganz. 62. 1882. The type has not been seen and is presumed to have been destroyed during the last war. From the description it might be the yellow variety of *I. polystachya* L. or *I. dubia* Vent. (see notes under these species).

I. bifaria Moench, Meth. Suppl. 213. 1802. No specimen has been seen but it is very unlikely that the plant described is an *Ixia*. It is possibly *Lapeirousia laxa* (Thunb.) N. E. Br.

I. bimaculata Schrank, Denkschr. Bot. Ges. Regensb. 2: 182. 1822. No specimen has been seen. From the description it does not seem to be an *Ixia*—it might perhaps be a form of *Sparaxis tricolor*.

I. coccinea Eckl. Top. Verz. 24. This is probably *I. campanulata* Houtt. (syn *I. coccinea* Thunb., partly). Ecklon cited Brehm as the collector and there are specimens of *I. campanulata* collected by him in the herbaria of the Botanic Gardens, Brussels, and Botanische Staatssammlung, Munich, named *Gladiolus coccineus* Schrank.

I. concinna Salisb. l. c. 37. No specimen has been seen and the species cannot be determined from the description.

I. conspicua Salisb. l. c. 36. This might be *I. dubia* Vent. but no specimen has been seen and the description is inadequate.

I. dinteri Schinz, Bull. Herb. Boiss. 20: 14. 1900. In 1941 Foster suggested that this was a *Lapeirousia* (Contrib. Grey Herb. No. 135, 7), and this was confirmed in July 1960 in the following note received from Mrs. A. A. Mauve, National Herbarium, Pretoria: "Soelch of Munich in a MS. Liliales of S.W.A. makes *I. dinteri* a synonym of *Lapeirousia coerulea* Schinz".

I. fallax Salisb. l. c. 34. No specimen has been seen and the species cannot be determined from the description.

I. flabellularis Vahl, Enum. 2: 67. 1806. This has been cited as a synonym of *Tritonia flava* (Ait.) Ker and from the description it is probably correct. The type has not been seen.

I. flava Hornem. Hort. Hafn. Suppl. 5. 1815. The name is a later homonym of *I. flava* Lam. (= *Romulea bulbocodioides*). *I. flava* Hornem. has been cited as a synonym of *I. maculata* L. but this cannot be confirmed as no specimen has been seen and the description is inadequate. *I. flava* Eckl. Top. Verz. 25, a *nomen nudum*, is probably the same as *I. flava* Hornem.

I. fugax Salisb. l. c. 34. The preceding species referred to in the description is *Romulea columnae* and it is evident from the description that this must also be a species of *Romulea*.

I. geminiflora Schrank, Denks. Bot. Ges. Regensb. 2: 188. From the description it is doubtful if this is an *Ixia*. No specimen has been seen.

I. hexandra Schrank, l. c. 185. This is *Cyanella lutea* L. f. Specimens of *C. lutea*, named *I. hexandra*, in the herbaria of the Botanic Gardens, Brussels, and the Botanische Staatssammlung, Munich, collected by

Brehm near Cape Town, agree very well with the detailed description given by Schrank.

I. lineata Salisb. l. c. 35. No specimen has been seen and it is not possible to determine the species from the description.

I. minima Schrank, l. c. 179. From the description it is very unlikely that this is an *Ixia*. It is possibly *Pauridia minuta* (L. f.) Schinz.

I. mutabilis Salisb. l. c. 34. No specimen has been seen and it is not possible to determine the species from the description.

I. ochracea Eckl. l. c. 25, *nomen nudum.*

I. pallide flavens Eckl. l. c. 25. The identity of this species is uncertain. The name has been cited as a synonym of *I. curta* Andr. and *I. polystachya* L. In the Delessert Herbarium, Geneva, *Ecklon* 269, named *I. pallide-flava* Eckl., is *I. maculata* L.

I. propinqua Salisb. l. c. 38. No specimen has been seen. The brief description suggests that the plant is a *Tritonia* rather than an *Ixia.*

I. punicea Eckl. l. c. 24, *nomen nudum.* The name is a later homonym of *I. punicea* Jacq. (= *Babiana villosa* (Ait.) Ker).

I. reticularis Salisb. l. c. 37. No specimen has been seen and it is not possible to determine the species from the description.

I. socialis Salisb. l. c. 35. No specimen has been seen and the species is not known.

I. sordida Hornem. Hort. Hafn. Suppl. 6. No specimen has been seen but from the short description and reference to *I. monantha* De la R. (= *Sparaxis monanthos* (De la R.) N. E. Br.), this is probably a *Sparaxis.*

I. sprengeliana Schultes, Mant. 1: 282. 1822. (= *I. punicea* Spreng. Neue Entdeck. 1: 254. 1820; non Jacq. 1786—93). No specimen has been seen but from the description it is possible that this is a form of *I. latifolia* De la R. It has been cited as a synonym of *I. patens* Ait.

I. stellaris Hill, Syst. Veg. 10: 3. 1765. No specimen has been seen and it is not possible to determine the species from the description.

I. striata Vahl, Enum. 2: 65. Baker cited this as a synonym of *I. scariosa* Thunb. The type has not been seen but from the description it might perhaps be a form or variety of *I. latifolia* De la R (syn. *I. scariosa* Thunb.).

I. tardiflora Salisb. 1. c. 38. No specimen has been seen and it is not possible to determine the species from the description. It might perhaps be a *Tritonia.*

I. tenuifolia Vahl, 1. c. 62. The type has not been seen and the identity of the species is uncertain. In the Natural History Museum Herbarium, Stockholm, specimens of *I. framesii* L. Bolus and *I. latifolia* De la R. var. *angustifolia* Lewis are named *I. tenuifolia* Vahl by Klatt, but it is doubtful if either is correct. The description suggests a species of *Tritonia* rather than *Ixia.*

I. venosa (Willd) Link. Enum. Pl. Hort. Berol. 1: 51. 1821. The type has not been seen but from the description it is fairly certain that this is a *Tritonia*, possibly *T. lineata.*

GEOGRAPHICAL DISTRIBUTION

The genus is endemic to the Cape of Good Hope and its distribution within this area is characteristic of members of the Cape Flora, with the greatest concentration of species in the south-western districts. The highest number of species is found in the Caledon Division, where fifteen have been recorded. There are fourteen in the Paarl—Wellington, eleven or twelve in the adjoining Worcester, Stellenbosch, Tulbagh and Malmesbury Divisions, as well as Piketberg, and in the Clanwilliam Division thirteen. From Clanwilliam there is a sharp decrease northwards to Namaqualand and also eastwards through the more arid districts of Calvinia and Sutherland to Fraserburg, with only one species in the last. There is also a marked decrease from Caledon eastwards and only one species, *I. orientalis*, occurs in the coastal districts from Knysna to Bathurst, the latter the most easterly record for the genus. One species, *I. trichorriza*, described from Griqualand East, has since been found to belong to the genus *Dierama*, to which it was transferred by Dr. N. E. Brown in 1929.

The numbers of species recorded from the various magisterial divisions are given in the accompanying table and shown on the map. In the table the total number of species in each division is given in the column on the left, followed in the next three columns by the number in each of the three sections of the subgenus *Ixia*, and on the right those in the subgenus *Dichone*.

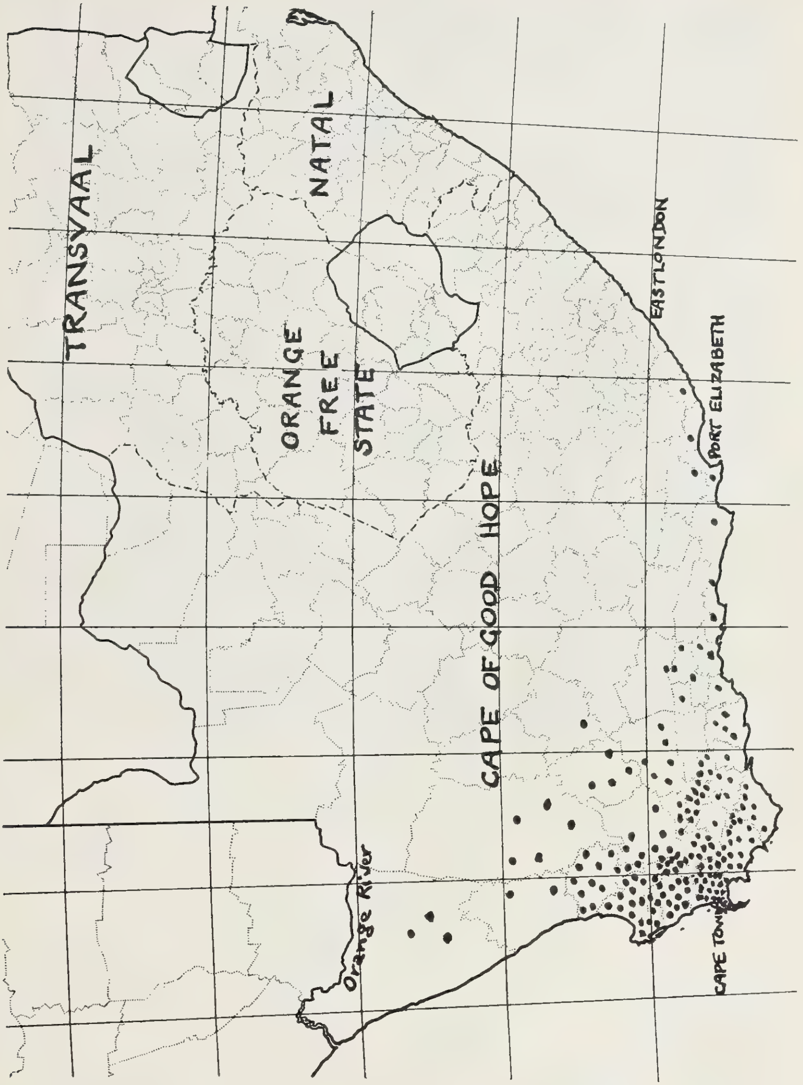
An analysis of these figures reveals that the section *Ixia*, with the largest number of species (18), has the most limited distribution, being almost entirely confined to the south-western districts, with the greatest concentration in Tulbagh and Paarl—Wellington, and only one species in Ceres and two in the Montagu Division. The small section *Hyalis*, with five species, has a very similar distribution except that the largest number of species occurs in the Caledon Division and one of them extends to Laingsburg and Ladismith. Section *Morphixia*, with thirteen species, is the most widely distributed, having one to five species in each of the divisions and its principal area of concentration in the Clanwilliam, Ceres and Worcester Divisions.

Five of the eight species in subgenus *Dichone* occur in the Caledon Division and three in Paarl—Wellington, but apart from this the widespread distribution of this comparatively small group is most like that of section *Morphixia,* with species occurring in the dry regions and those with a fairly high average rainfall. One of them, *I. scillaris,* occurs through the coastal districts from Namaqualand to Caledon.

There are about seven local endemics in the section *Ixia,* e.g. *I. viridiflora, I. vinacea, I. purpureorosea, I. stolonifera, I. curta* and *I. gloriosa,* and only one to three in each of the other sections and the subgenus *Dichone,* viz. *I. brunneobractea, I. framesii* and *I. cochlearis* in *Morphixia, I. spendida* in *Hyalis* and *I. curvata* and *I. trinervata* in *Dichone.* Four species in section *Morphixia* are extremely widespread, namely, *I. orientalis, I. capillaris, I. latifolia* and *I. rapunculoides*—in each of the last two I have distinguished about six local varieties.

The section *Morphixia* I consider to be the most primitive in the genus. A few of the species in this group with more or less campanulate flowers,

	Total for Genus (44 species)	Subgenus IXIA			Subgenus DICHONE (8 species)
		Section Morphixia (13 species)	Section Ixia (18 species)	Section Hyalis (5 species)	
Namaqualand . .	3	2	–	–	1
Calvinia	5	4	–	–	1
Sutherland	4	2	–	–	2
Fraserburg	1	1	–	–	–
Vanrhynsdorp . .	2	1	–	–	1
Clanwilliam	13	5	5	2	1
Piketberg	11	3	4	2	2
Ceres	7	5	1	1	–
Tulbagh	12	2	8	1	1
Worcester	11	5	4	1	1
Hopefield	7	1	5	1	–
Malmesbury	11	3	5	1	2
Bellville	5	2	2	1	–
Cape	7	1	4	1	1
Paarl—Wellington . .	14	4	7	–	3
Stellenbosch—Somerset West	11	4	5	–	2
Caledon	15	3	4	3	5
Bredasdorp	6	1	1	2	2
Robertson	1	1	–	–	–
Montagu	8	4	2	1	1
Swellendam	8	4	2	1	1
Riversdale	4	2	1	–	1
Ladismith	3	2	–	1	–
Laingsburg	6	4	–	1	1
Mossel Bay	1	1	–	–	–
George	2	1	–	–	1
Oudtshoorn	3	2	–	–	1
Prince Albert	2	1	–	–	1
Knysna—Bathurst . . (coastal districts)	1	1	–	–	–



Map showing distribution of IXIA in South Africa.

such as *I. capillaris* and *I. rapunculoides*, bear a close resemblance to the genus *Dierama* and in a previous paper on the Iridaceae I have expressed the view that *Ixia* has a close phylogenetic affinity with that genus (Ann. S. Afr. Mus. vol. 40, pp. 68—72, 88). As far as is known all except one species of *Dierama* have evergreen leaves, which in my opinion indicates that it is more primitive than the geophytic genus *Ixia* with its deciduous aerial leaves, and it has an entirely different distribution, extending from Tropical Africa through the Transvaal, Orange Free State, Natal and eastern Cape Province to Humansdorp. *Ixia*, on the other hand, is confined to the western Cape Province with only one species extending along the south-east coast as far as Bathurst. It appears to me that *Ixia* may well have evolved from *Dierama* due to more arid conditions on the inland side of the mountain ranges of the west and south-western Cape. It is on the borders of this area that the largest number of the more primitive species occur, while the greatest area of development of the recent species in the section *Ixia* is on the western side of these mountain ranges and on the coastal plains.

It is of interest to note that *Geissorrhiza*, a genus fairly closely allied to *Ixia* but with a different type of corm and bract, has a limited distribution very similar to that of *Ixia*, while the very closely allied genus *Hesperantha* is well represented not only in the Western Cape Province but also in the eastern parts, Natal, the Transvaal, and extends into Tropical Africa. The theory that *Ixia* has evolved from a genus with a much wider distribution extending into Tropical Africa would be in accordance with the view put forward by Dr. M. R. Levyns that the Cape Flora originated somewhere in Tropical Africa and migrated southwards (S. Afr. Journ. Science Vol. 49, pp. 155—164 (1952)).

APPENDIX

To facilitate reference to changes which have been made in connection with a large number of species, the following list of names published under IXIA in the first volume and supplements of the Kew Index has been compiled, and an asterisk used to denote those which have been changed since they were first catalogued. The names placed within brackets are of species which are not of South African origin and belong to genera other than *Ixia*.

abbreviata Houtt. Handleid. 12: 41. t. 78. f. 3 = I. maculata L.
(*acuta* Bartr. Fl. N. Am. 1: 76 = Nemastylis geminiflora).
**acuta* Licht. ex Roem. & Schult. Syst. 1: 383 = Hesperantha acuta (Licht.) Ker.
africana Hornem. Cat. Hort. Havn. 68; ex Roem. & Schult. Syst. 1: 424 = Babiana rubrocyanea (Jacq.) Ker.
**africana* L. Sp. Pl. 36 = Aristea africana (L.) Hoffmnsg.
alba Eckl. Top. Verz. 27. Nomen nudum. See excluded species.
alba L. Syst. ed. 10. 862 = Sparaxis bulbifera (L.) Ker.
alboflavens Eckl. l. c. 27. Nomen nudum. = Ixia conferta Foster var. ochroleuca (Ker) Lewis.
**alopecuroides* L. f. Suppl. 92 = Micranthus alopecuroides (L. f.) Eckl.
ambigua Salisb. Prod. 39. See excluded species.
(*americana* Aubl. Pl. Gui. 1: 33 = Eleuthrine plicata).
(*americana* Sessé & Moc. Pl. N. Hispan. ed. 1. 11. Not known).
amoena Link. Enum. Hort. Berol. 1: 52. See excluded species.
amoena Salisb. l. c. 35. See excluded species.
anemonaeflora (DC in) Red. Lil. t. 85 = Sparaxis bulbifera (L.) Ker.
**anemonaeflora* Jacq. Ic. t. 273; Coll. Suppl. 10 = I. campanulata Houtt.
angusta Jacq. Ic. t. 279 = Hesperantha angusta (Jacq.) Ker.
**angusta* L. Bolus, S. Afr. Gard. 21: 367 = I. patens Ait.
angustifolia Eckl. l. c. 25. Nomen nudum. = I. dubia Vent.
angustifolia Klatt in Dur. & Schinz, Consp. Fl. Afr. 5: 182 = I. monadelpha De la R.
**antholyzaeformis* Lam. Encyc. 3: 334. Not Ixia. See excluded species.
arcuata Burm. f. Fl. Cap. Prod. 2. See excluded species.
**aristata* Ker, Bot. Mag. t. 589 = I. longituba N. E. Br.
aristata Schneev. Ic. t. 32 = I. patens Ait.
aristata Ait. Hort. Kew. 1: 57 = Sparaxis grandiflora (De la R.) Ker.
**aristata* Thunb. Diss. Ixia 14 = I. campanulata Houtt.
**aulica* Ait. Hort. Kew. 1: 57 = I. latifolia De la R.
**aurantiaca* Klatt, Abh. Naturf. Ges. Halle 12: 397 = I. polystachya L. var. lutea (Ker) Lewis.
(*autumnalis* Salisb. l. c. 33 = Crocus autumnalis).

**avellana* Foster, Contrib. Gray Herb. No. 114. 47 (1936) = I. odorata Ker ?

azurea Banks ex Ker, Bot. Mag. t. 598 = Geissorrhiza rochensis (Ker) Ker.

azurea Grey, Hardy Bulbs 1: 283 (1937), sine descr. lat. Nomen illegitimum.

bellendenii Foster, Contrib. Gray Herb. No. 114. 47. Nom. nov. p. 155

**bicolor* Ker, Bot. Mag. t. 584 = Synnotia villosa (Burm. f.) N. E. Br.

**bicolor* Thunb. in Hoffm. Phytogr. Blaett. 1 (1803) = Geissorrhiza bicolor (Thunb.) N. E. Br.

bicolorata Klatt, Abh. Naturf. Ges. Halle 12: 396. See excluded species.

bifaria Moench. Meth. Suppl. 213. See excluded species.

bimaculata Schrank, Denkschr. Bot. Ges. Regensb. 11: 182. See excluded species.

**bolusii* Lewis, Journ. S. Afr. Bot. 4: 10 (1938) = I. paucifolia Lewis.

**brevifolia* Baker, Handbk. Irid. 165 = Gladiolus subaphyllus N. E. Br.

bulbifera L. Cent. Pl. 2: 4; Amoen. Acad. 4: 300 = Sparaxis bulbifera (L.) Ker.

bulbocodiodes De la R. Descr. Pl. Nov. 19 = Romulea bulbocodioides (De la R.) Baker.

bulbocodium Lam. Encyc. 3: 335 = Romulea rosea (L.) Eckl.

(*bulbocodium* L. Sp. Pl. ed. 2. 51 = Romulea bulbocodium).

(*bulbocodium* Sibth. & Sm. Fl. Graec. 1: 26. t. 36 = Romulea linaresii).

**bulbocodium* Thunb. Diss. Ixia 6 = Romulea rosea (L.) Eckl.

**burrmanni* F. G. Dietr. Vollst. Lexik. Gaertn. Nachtr. 4: 253 (1818) = Hesperantha spicata (Burm. f.) N. E. Br.

caerulescens Eckl. Top. Verz. 26. Nomen nudum.

**campanulata* Banks ex Roem. & Schult. Syst. 1: 391 = I. campanulata Houtt.

campanulata Houtt. Handl. 12: 42. t. 78. f. 4. p. 127

campanulata Lam. Illustr. 1: 109 (1791) = Romulea sp.

campanuloides Eckl. Top. Verz. 26. Nomen nudum.

cana Eckl. l. c. = I. viridiflora hybrid.

candida Eckl. l. c. 27 = I. campanulata Houtt.

**candida* (Delile in) Red. Lil. 8: t. 426 = I. patens Ait.

capillaris L. f. Suppl. 92 (1781); Thunb. Diss. Ixia 12. t. 2. f. 2.

capitata Andr. Bot. Rep. t. 50 (1797) = I. maculata L.

(*carmosina* Hort. ex Hoeven & De Vriese, Tijdschr. 8: 164. Not known).

**cartilaginea* Lam. Encyc. 3: 340 = I. monadelpha De la R.

**caryophyllacea* Burm. f. Fl. Cap. Prod. 1 = Freesia caryophyllacea (Burm. f.) N. E. Br.

**cepacea* (DC. in) Red. Lil. t. 96 = Micranthus tubulosus (Burm. f.) N. E. Br.

(*chinensis* L. Sp. Pl. 36 = Belamcanda chinensis).

chloroleuca Jacq. Ic. t. 272; Coll. 4: 180 = Romulea chloroleuca (Jacq.) Baker.

ciliaris Salisb. ex Ker, Bot. Mag. sub. t. 549. Nomen nudum.

cinnamomea Andr. Bot. Rep. t. 44 = Hesperantha falcata (L. f.) Ker.

**cinnamomea* L. f. Suppl. 92 (1781); Thunb. Diss. Ix. 10 = Hesperantha spicata (Burm. f.) N. E. Br. var. cinnamomea (L. f.) Foster.

coccinea Eckl. Top. Verz. 24. Nomen nudum. See excluded species.

**coccinea* Thunb. Fl. Cap. 1: 241 = I. campanulata Houtt. and I. patens Ait.

8. cochlearis Lewis, Fl. Pl. Afr. t. 969 (1946). p.9

*(*coelestina* Bartr. ex Willd. Sp. Pl. 1: 200; vide Foster, Contrib. Gray Herb. No. 155. 15 (1945) = Sphenostigma coelestina).

**coerulescens* Pers. Syn. 1: 48 = Babiana villosula (Gmel.) Ker ex Steud.

**columellaris* Ker, Bot. Mag. t. 630 = I. monadelpha De la R.

(*columnae* Schult. Mant. 1: 278 = Romulea columnae).

columnaris Salisb. Prod. 36 = I. monadelpha De la R.

concinna Salisb. l. c. See excluded species.

concolor Salisb. l. c. = I. campanulata Houtt.

10. conferta Foster, Contrib. Gray Herb. No. 114. 47 (= *I. ovata* (Andr.) Sweet). p. 1[illegible]

conica Salisb. l. c. = I. maculata L.

conspicua Salisb. l. c. See excluded species.

cooperi Baker, Handbk. Irid. 166 = Tritonia cooperi (Baker) Klatt.

corymbosa L. Cent. Pl. 2: 4; Amoen. Acad. 4: 300 = Lapeirousia corymbosa (L.) Ker.

**crateroides* Ker, Bot. Mag. t. 594 (1802) = I. campanulata Houtt.

38. crispa L. f. Suppl. 91.

crispifolia Andr. Bot. Rep. t. 35 = Lapeirousia corymbosa (L.) Ker.

crocata Red. Lil. t. 335 = Tritonia miniata (Jacq.) Ker.

crocata L. Sp. Pl. ed. 2. 52 = Tritonia crocata (L.) Ker.

**crocea* Thunb. Fl. Cap. 1: 218 = Romulea triflora (Burm. f.) N. E. Br.

cruciata Jacq. Coll. Supp. 16 = Romulea cruciata (Jacq.) Baker.

[illegible]. curta Andr. Bot. Rep. t. 564. p. 145

**cyanea* Pers. Syn. 1: 49 = Babiana rubrocyanea (Jacq.) Ker.

densiflora Klatt, Abh. Naturf. Ges. Halle 12: 397 = I. patens Ait.

deusta Ait. Hort. Kew. 1: 60 = Tritonia deusta (Ait.) Ker.

**dinteri* Schinz, Mem. Herb. Boiss. No. 20: 14 = Lapeirousia. See excluded species.

**dispar* N. E. Br. Kew Bull. 1929, 134 = I. patens Ait.

disticha Lam. Encyc. 3: 333 = Witsenia maura (L.) Thunb.

dubia Eckl. Top. Verz. 26. Nomen nudum.

28. dubia Vent. Choix 10. p. 134

*_duckittiae_ L. Bolus, S. Afr. Gard. 21: 281—2 = I. maculata L.

*_elegans_ (Regel) N. E. Br. Journ. Linn. Soc. Bot. 48: 43 (1928) = I. polystachya L.

*_elliptica_ Thunb. Fl. Cap. 1: 244 = Lapeirousia juncea (L. f.) Pourr.

(_elongata_ Vahl, Enum. 2: 51 = Romulea elongata).

emarginata Lam. Encyc. 3: 342 = Lapeirousia juncea (L. f.) Pourr.

(_ensifolia_ Noronha in Verh. Batav. Gen. V (1790) = Pardanthus chinensis).

erecta Berg. Descr. Pl. Cap. 5 (1767) = I. polystachya L.

erecta Jacq. Hort. Schoenbr. t. 18 (1797) = I. polystachya L. var. lutea (Ker) Lewis.

erecta Thunb. Diss. Ixia 16 (1783) = _I. avellana_ Foster = odorata Ker?

*_erosa_ Salisb. Prod. 36 = Geissorrhiza erosa (Salisb.) Foster.

(_europaea_ Pers. Syn. 1: 46 = _Trichonema bulbocodium_).

*_excisa_ L. f. Suppl. 92; Thunb. Diss. Ixia 19 = Geissorrhiza ovata (Burm. f.) Asch. & Graebn.

fabricii De la R. Descr. Pl. Nov. 18 = Laperousia anceps Ker.

falcata Thunb. Diss. Ixia 19 = Hesperantha falcata (L. f.) Ker, partly.

fallax Salisb. Prod. 34. See excluded species.

fastigiata Lam. Encyc. 3: 337 = Lapeirousia corymbosa (L.) Ker var.

fenestrata Jacq. Coll. 3: 270 = Tritonia hyalina (L. f.) Baker.

*_fenestrata_ Thunb. in Hoffmn. Phyt. Blaett. 4 (1803) = Tritonia laxifolia Benth.

*_filifolia_ Red. Lil. t. 251. f. 2 = Romulea triflora (Burm. f.) N. E. Br.

filiformis Vent. Jard. Cels. t. 48 (1800) = I. patens Ait.

fimbriata Lam. Encyc. 3: 339 = Sparaxis grandiflora (D la R.) Ker.

fistulosa Andr. Bot. Rep. t. 59 (1799) = Hesperantha radiata (Jacq.) Ker.

*_fistulosa_ Ker, Bot. Mag. t. 523 = Micranthus tubulosus (Burm. f.) N. E. Br.

*_flabellifolia_ De la R. Descr. Pl. Nov. 24 = Tritonia flabellifolia (De la R.) Lewis.

*_flabelliformis_ Salisb. Prod. 37 = Babiana purpurea (Jacq.) Ker.

flabellularis Vahl, Enum. 2: 67 = Tritonia flava (Ait.) Ker.

flaccida Salisb. l. c. 35 = I. patens Ait.

flava Hornem. Hort. Hafn. Suppl. 5 (1815). See excluded species.

flava Lam. Illustr. 1: 109 = Romulea bulbocodioides (De la R.) Baker.

*_flavescens_ Eckl. Top. Verz. 26. Nomen nudum. = I. odorata Ker.

flavovirens Eckl. l. c. Nomen nudum.

flexuosa Ker, Bot. Mag. t. 127 = _I. hybrida_ Ker=_I._ polystachya hybrid?

flexuosa L. Sp. Pl. ed. 2, 51. P 11c

*_fragrans_ Jacq. Coll. Suppl. 9 = Sparaxis sp.

framesii L. Bolus, S. Afr. Gard. 21: 367, 369. p. 91

fruticosa L. f. Suppl. 93; Thunb. Diss. Ixia 5. t. 1. f. 3 = Nivenia fruticosa (L. f.) Baker.

12 fucata Ker, Bot. Mag. t. 1379. p. 9

fugacissima L. f. Suppl. 94 = Galaxia fugacissima (L. f.) Druce.

fugax Hornem. Hort. Hafn. 1: 50 = Romulea rosea (L.) Eckl.

fugax Salisb. Prod. 34 = Romulea sp. See excluded species.

furva Banks ex Ker in Konig & Sims Ann. Bot. 1: 224 = Geissorrhiza furva Ker ex Baker.

**fuscocitrina* (DC. in) Red. Lil. t. 86 = I. maculata L. var. fuscocitrina (DC.) Lewis.

galaxia L. f. Suppl. 93 = Galaxia ovata (L. f.) Thunb.

galaxioides Klatt ex Dur. & Schinz, Consp. Fl. Afr. 5: 184 = I. monadelpha De la R.

gawleri Schrad. Neues Journ. 4: 67 (1810) = Lapeirousia juncea Pourr.

**geminata* Vahl, Enum. 2: 68 = Geissorrhiza geminata E. Mey. ex Baker.

geminiflora Schrank, Denkschr. Bot. Ges. Regensb. 2: 188. See excluded species.

gibba Salisb. Prod. 38 = Tritonia deusta (Ait.) Ker.

gladiata L. f. Suppl. 93 = Bobartia gladiata (L. f.) Ker.

gladiolaris Lam. Encyc. 3: 341 = Tritonia securigera (Ait.) Ker.

gracilis Salisb. l. c. 37 = I. capillaris Thunb.

grandiflora De la R. Descr. Pl. Nov. 23 = Sparaxis grandiflora (De la R.) Ker.

**heterophylla* Willd. Sp. Pl. 1: 199 (1797) = Lapeirousia heterophylla (Willd.) Foster.

**hexandra* Schrank, Denkschr. Bot. Ges. Regensb. 2: 185 = Cyanella lutea L. f. See excluded species.

hirsuta L. Mant. 1: 27 = Dilatris corymbosa Berg.

**hirta* Thunb. Diss. Ixia 9 = Geissorrhiza erosa (Salisb.) Foster var. kermesina (Klatt) Foster.

(*hochstetterina* A. Rich. Tent. Fl. Abyss. 2: 309 = Hesperantha petitiana (A. Rich).) Baker).

holosericea Jacq. Hort. Schoenbr. t. 17 = Sparaxis grandiflora (De la R.) Ker var.

humilis Thunb. Diss. Ixia 8 = Geissorrhiza humilis (Thunb.) Ker.

hyalina (DC. in) Red. Lil. t. 87 = Tritonia squalida (Ait.) Ker.

hyalina L. f. Suppl. 91 = Tritonia hyalina (L. f.) Baker.

hyalina Salisb. Prod. 38; Willd. Enum. Hort. Berol. 57 = Tritonia crocata (L.) Ker.

hybrida Ker in Konig & Sims Ann. Bot. 1: 227 = I. polystachya hybrid.

imbricata De la R. Descr. Pl. Nov. 17 = Geissorrhiza imbricata (De la R.) Ker.

**incarnata* Jacq. Ic. t. 282; Coll. Suppl. 12 = I. latifolia De la R.

**inflexa* De la R. Descr. Pl. Nov. 15 = Hesperantha inflexa (De la R.) Foster.

iridifolia De la R. l. c. 24 = Tritonia crocata (L.) Ker.

iridifolia Link. Enum. Hort. Berol. 1: 52 = Watsonia meriana Mill.

juncea Link. l. c. 50 = Geissorrhiza juncea (Link.) A. Dietr.

lacera Herb. Linn. ex Roem. & Schult. Syst. 1: 398 = Sparaxis grandiflora (De la R.) Ker.

**lancea* Jacq. Ic. t. 281 = I. marginifolia (Salisb.) Lewis.

**lancea* Thunb. Diss. Ixia 18 = Tritonia lancea (Thunb.) N. E. Br.

lapeirousia J. F. Gmel. Syst. 108 (1796) = Lapeirousia compressa Pourr. (1788).

larochei Roem. & Schult. 1: 379 = Geissorrhiza rochensis (Ker) Ker.

5. *latifolia De la R. Descr. Pl. Nov. 22. p. 81

**laurea* Steud. Nom. ed. 2, 1: 779, 841, sphalm. = I. marginifolia (Salisb.) Lewis.

leipoldtii Lewis, Ann. S. Afr. Mus. 40: 121 (1954). 8

**leucantha* Jacq. Ic. t. 278; Coll. Suppl. 11 = I. polystachya L.

lilacina Eckl. Top. Verz. 27. Nomen nudum. = I. polystachya L.

liliago (DC. in) Red. Lil. t. 109 = Sparaxis grandiflora (De la R.) Ker.

**linearis* Jacq. Coll. 4: 183 = Hesperantha radiata (Jacq.) Ker.

**linearis* L. f. Suppl. 92; Thunb. Diss. Ixia 12 = Gladiolus linearis (L. f.) N. E. Br.

lineata Salisb. Prod. 35. See excluded species.

**longiflora* Berg. Descr. Pl. Cap. 7 = I. paniculata De la R.

**longiflora* Lam. Encyc. 3: 342 = I. paniculata De la R.

longifolia Jacq. Hort. Vind. 3: 47 = Hexaglottis longifolia (Jacq.) Vent.

36. longituba N. E. Br. Journ. Linn. Soc. Bot. 48: 43 (1928). Nom. nov. p. 156

**lutea* (Ker) Baker, Journ. Linn. Soc. 16: 91 = I. polystachya L. var. lutea (Ker) Lewis.

**lutea* Eckl. Top. Verz. 24 = I. conferta Foster var. ochroleuca (Ker) Lewis.

(*lutea* Sessé & Moc. Fl. Mexic. 14 (1893). Not known).

maculata L. Sp. Pl. ed. 2, 1664; Mant. 2: 320. p. 137

(*magellanica* Lam. Illustr. 1: 109; Encyc. 3: 334 = Tapeinia magellanica).

marginata Ait. Hort. Kew. 1: 59 = Watsonia marginata (Ait.) Ker.

meriana Link. Enum. Hort. Berol. 1: 52 = Watsonia meriana Mill.

14. metelerkampiae L. Bolus, S. Afr. Gard. 19: 27 (1929). p. 130

(*mexicana* Sessé & Moc. Pl. N. Hispan. 11. Not known).

37. micrandra Baker, Journ. Bot. 14: 237 (1876). p.

milleri Berg. Descr. Pl. Cap. 8 = I. maculata L.

miniata (DC. in) Red. Lil. t. 89 = Tritonia deusta (Ait.) Ker.

p. 66

miniata Jacq. Hort. Schoenbr. t. 24 = Tritonia miniata (Jacq.) Ker.

minima Schrank, Denkschr. Bot. Ges. Regensb. 2: 179. See excluded species.

*minuta L. f. Suppl. 92 = Pauridia minuta (L. f.) Dur. & Schinz.

monadelpha De la R. Descr. Pl. Nov. 22. p. 146

monadelphia Burm. f. Fl. Cap. Prod. 1 = I. monadelpha De la R.

**monanthos* De la R. Descr. Pl. Nov. 21 = Sparaxis monanthos (De la R.) N. E. Br.

**monanthos* Thunb. Fl. Cap. 1: 226 = Geissorrhiza monantha (Thunb.) Eckl.

mutabilis Salisb. Prod. 34. See excluded species.

**namaquana* L. Bolus, S. Afr. Gard. 21: 369 = I. rapunculoides Red. var. namaquana (L. Bol.) Lewis.

neglecta Schult. Mant. 1: 279 = Romulea speciosa (Ker) Baker.

**nervosa* Baker, Handbk. Irid. 166 = Tritoniopsis nervosa (Baker) Lewis.

nervosa Vent. Choix sub t. 10—see under I. dubia Vent.

nigro-albida Klatt, Abh. Naturf. Ges. Halle 12: 396 = I. conferta Foster var. ochroleuca or hybrid.

**obtusata* Soland ex Ker, Bot. Mag. t. 672 = Geissorrhiza imbricata (De la R.) Ker.

ochracea Eckl. Top. Verz. 25. Nomen nudum.

**ochroleuca* G. Don in Sweet Hort. Brit. ed. 2, 502 (1830); Bot. Mag. t. 1285 = I. conferta Foster var. ochroleuca (Ker) Lewis.

**ochroleuca* Vahl, Enum. 2: 50 = Romulea chloroleuca (Jacq.) Baker.

odorata Ker, Gen. Irid. 101.

orientalis L. Bolus, S. Afr. Gard. 19: 27 (1929).

**ornithogaloides* Lichst. ex Roem. & Schult. Syst. 1: 376 = Geissorrhiza ornithogaloides Klatt.

**ovata* Burm. f. Fl. Cap. Prod. 1 = Geissorrhiza ovata (Burm. f.) Asch. & Graebn.

**ovata* Sweet Hort. Brit. 399; Klatt Abh. Naturf. Ges. Halle 12: 396 = I. conferta Foster.

pallens Ait. ex Steud. Nom. ed. 1. 453 = I. patens Ait.

pallide flavescens Eckl. Top. Verz. 25. See excluded species.

palliderosea Eckl. l. c. 24. Nomen nudum. = I. flexuosa L.

32 paniculata De la R. Descr. Pl. Nov. 26. t. 1.

18 patens Ait. Hort. Kew. 1: 59.

**patens* Willd. Enum. Hort. Berol. 56 = I. patens Ait.

(*parviflora* Salisb. Prod. 34 = Romulea columnae).

34 paucifolia Lewis, S. Afr. Gard. 23: 213 (1933).

pectinata Vahl, Enum. 2: 62 = Tritonia pectinata (Vahl) Ker.

pendula L. f. Suppl. 91; Thunb. Diss. Ixia 15 = Dierama pendulum (L. f.) Baker.

*pentandra L. f. Suppl. 92 = Ixia scillaris L.

(*petitiana* A. Rich. Tent. Fl. Abyss. 2: 309 = Hesperantha petitiana (A. Rich.) Baker).

**phalangioides* Roem. & Schult. Syst. 1: 385 = Geissorrhiza juncea (Link.) A. Dietr.

**phlogiflora* (Delile in) Red. Lil. t. 432 = I. latifolia De la R.

**pigmaea* Burm. f. Fl. Cap. Prod. 1 = Babiana pygmaea (Burm. f.) N. E. Br.

pilosa L. f. Suppl. 92 = Hesperantha pilosa (L. f.) Ker.

**planifolia* Mill. Ic. 160. t. 239. f. 2; ex Roem. & Schult. Syst. 1: 400 = Tritonia hyalina (L. f.) Baker.

plantaginea (Soland. in) Ait. Hort. Kew 1: 59 = Micranthus plantagineus (Ait.) Eckl.

**plicata* Lam. Encyc. 3: 336 = Babiana stricta (Ait.) Ker.

**plicata* L. Cent. Pl. 2: 4; Amoen. Acad. 4: 300 = Babiana villosula (Gmel.) Ker ex Steud.

**polystachia* Ker, Bot. Mag. t. 629 = I. micrandra Baker var. confusa Lewis var. nov.

polystachya (DC. in) Red. Lil. t. 126 = I. flexuosa L.

**polystachya* Jacq. Ic. t. 275; Coll. 3: 269 = I. stricta (Eckl. ex Klatt) Lewis.

[illegible] polystachya L. Sp. Pl. ed. 2, 51. p. 102

prasina Soland. ex Baker, Journ. Linn. Soc. Bot. 16: 92 = I. viridiflora Lam.

propinqua Salisb. Prod. 38. See excluded species.

**pudica* Banks ex Ker, Bot. Mag. sub t. 575 = Romulea rosea (L.) Eckl. var. pudica (Ker) Baker.

**pulcherrima* Eckl. Top. Verz. 24 = I. campanulata Houtt. & I. framesii L. Bolus.

pulchra Salisb. Trans. Hort. Soc. 1: 320 = I. viridiflora Lam.

(*pumila* Forst. f. in Comm. Gotting. 9. t. 2 (1789) = Tapienia magellanica).

**punctata* Andr. Bot. Rep. t. 177 = Thereianthus bracteolatus (Lam.) Lewis.

punicea Eckl. Top. Verz. 24. Nomen nudum. = I. patens Ait.

**punicea* Jacq. Ic. t. 287; Coll. Suppl. 12 = Babiana villosa (Ait.) Ker.

**punicea* Spreng. Neue Entdeck. 1: 254 = *I. sprengeliana* Schultes.

(*purpurascens*) Tenore, Fl. Nap. 1: 13. t. 3 = Romulea purpurascens).

**purpurea* Jacq. Ic. 286; Coll. 3: 268 = Babiana purpurea (Jacq.) Ker.

purpurea Klatt ex Dur. & Schinz, Consp. Fl. Afr. 5: 186 = I. monadelpha De la R.

purpurea Lam. Encyc. 3: 341 = Tritonia crocata (L.) Ker.
**pusilla* Andr. Bot. Rep. t. 245 = Geissorrhiza pusilla (Andr.) Klatt.
**pygmaea* Roem. & Schult. Syst. 1: 403 = Babiana pygmaea (Burm. f.) N. E. Br.
**pyramidalis* Lam. Encyc. 3: 334; Illustr. 1: 108 = Lapeirousia speciosa Schltr.
quadrangula De la R. Descr. Pl. Nov. 16 = Geissorrhiza quadrangula (De la R.) Ker.
**quadrangularis* Burm. f. Fl. Cap. Prod. 1 = Geissorrhiza secunda (Berg.) Ker.
(*quartiniana* A. Rich. Tent. Fl. Abyss. 2: 310 = Acidanthera bicolor Hochst.).
radians Thunb. in Hoffm. Phytog. Blaett. 1 (1803) 3 = Geissorrhiza rochensis (Ker) Ker var. spithamaea (Ker) Ker ex Baker.
radiata Jacq. Coll. Suppl. 15 = Hesperantha radiata (Jacq.) Ker.
(*ramiflora* Tenore, Syll. 25 = Romulea ramiflora).
**ramosa* Ker, Bot. Mag. sub t. 549 = Geissorrhiza juncea (Link.) A. Dietr.
3. *rapunculoides (Delile in) Red. Lil. t. 431. p. 70
recurva (DC. in) Red. Lil. t. 251. f. 1 = Romulea bulbocodioides (De la R.) Baker.
recurva Vahl, Enum. 2: 58 = Hesperantha radiata (Jacq.) Ker.
recurvifolia Poir. Encyc. Suppl. 3: 201 = Romulea recurvifolia.
reflexa Andr. Bot. Rep. t. 14 = Ixia scillaris L.
reflexa Thunb. Fl. Cap. ed. 2, 55 = Romulea bulbocodiodes (De la R.) Baker.
reticularis Salisb. Prod. 37. See excluded species.
reticulata Thunb. Fl. Cap. ed. Schult. 60 = Tritonia lineata (Salisb.) Ker.
**retusa* Salisb. Prod. 35 = I. stricta (Eckl. ex Klatt) Lewis?
rochensis Ker, Bot. Mag. t. 598 = Geissorrhiza rochensis (Ker) Ker.
**rochensis* L. Bolus, Journ. Bot. 67: 133 = I. bellendenii Foster.
rosea L. Syst. ed. 12, 75 = Romulea rosea (L.) Eckl.
rotata (Ker) Andr. Recens. Pl. Bot. Rep. 3 = I. scillaris L.
rouxii Lewis, S. Afr. Gard. 21: 369 (1931).
**rubrocyanea* Jacq. Ic. t. 285; Coll. 3: 268 = Babiana rubrocyanea (Jacq.) Ker.
**scariosa* Thunb. Fl. Cap. 243 (1811) = I. latifolia De la R.
sceptrum Hort. ex Baker, Journ. Linn. Soc. Bot. 16: 158 = Watsonia marginata (Ait.) Ker.
scillaris L. Sp. Pl. ed. 2, 52.
scillaris Mill. Gard. Dict. ed. 8, n. 3 = Babiana stricta (Ait.) Ker.
**scillaris* Thunb. Diss. Ixia 13 = Geissorrhiza juncea (Link.) A. Dietr.
**secunda* Berg. Descr. Pl. Cap. 6 = Geissorrhiza secunda (Berg.) Ker.

**secunda* De la R. Descr. Pl. Nov. 17 = Geissorrhiza mathewsii L. Bolus var. eurystigma (L. Bol.) Foster.

**secunda* Houtt. Handleid. 12: 33—4. t. 78. f. 1 (1780) = Geissorrhiza rochensis (Ker) Ker var. spithamaea (Ker) Ker ex Baker.

serotina (Masson) Salisb. Prod. 34 = I. polystachya L.

setacea Thunb. Diss. Ixia 13 = Geissorrhiza setacea (Thunb.) Ker.

similis Salisb. Prod. 38 = Tritonia squalida (Ait.) Ker.

socialis Salisb. l. c. 35. See excluded species.

sordida Hornem. Hort. Hafn. Suppl. 6 = Sparaxis sp.

**sparrmanni* Schult. Mant. 1: 285 = Freesia sparrmanni (Thunb.) N. E. Br.

sparsa Mill. Gard. Dict. ed. 8, n. 7 = Sparaxis grandiflora (De la R.) Ker.

spathacea (Soland.) ex Ker, Bot. Mag. sub t. 1483 = Gladiolus trichonemifolius Ker.

**speciosa* Andr. Bot. Rep. t. 186 = I. campanulata Houtt.

spectabilis Salisb. Prod. 35 = I. viridiflora Lam.

**spicata* Andr. var. *viridi-nigra* Bot. Rep. t. 29 = I. viridiflora Lam.

spicata Burm. f. Fl. Cap. Prod. 1 = Hesperantha spicata (Burm. f.) N. E. Br.

**spicata* Willd. Sp. Pl. 1: 200 = Micranthus alopecuroides (L.) Eckl.

splendida Lewis, Journ. S. Afr. Bot. 4: 9 (1938). p. 153

sprengeliana Schult. Mant. 1: 282. See excluded species.

squalida Ait. Hort. Kew. 1: 61 = Tritonia squalida (Ait.) Ker.

**squalida* Thunb. in Hoffm. Phytogr. Blaett. 1: 4 = Tritonia securigera (Ait.) Ker.

stellaris Hill Veg. Syst. 10: 3. See excluded species.

stellata (*tricolor*) Hort. ex Roem. & Schult. Syst. 1: 401 = Sparaxis tricolor (Schneev.) Ker.

**stellata* Klatt, Abh. Naturf. Ges. Halle 12: 396 = I. latifolia De la R.

stohriae L. Bolus, S. Afr. Gard. 21: 281 (1931).

stolonifera Lewis, Ann. S. Afr. Mus. 40: 14 (1952). p.

striata Vahl, Enum. 2: 65. See excluded species.

**sublutea* Lam. Encyc. 3: 335 = Romulea triflora (Burm. f.) N. E. Br.

tardiflora Salisb. Prod. 38. See excluded species.

**tenella* Klatt, Abh. Naturf. Ges. Halle 12: 396 = I. capillaris L. f.

**tenuiflora* Vahl, Enum. 2: 66 = I. paniculata De la R. var. tenuiflora (Vahl) Baker.

tenuifolia Vahl, l. c. 62. See excluded species.

**teretifolia* Banks ex Ker, Bot. Mag. t. 523 = Micranthus tubulosus (Burm. f.) N. E. Br.

**thyrsiflora* De la R. Descr. Pl. Nov. 20 = Aristea thyrsiflora (De la R.) N. E. Br.
**thunbergii* Roem. & Schult. Syst. 1: 391 = Tritonia securigera (Ait.) Ker.
tortuosa Licht. ex Roem. & Schult. l. c. 375 = Romulea tortuosa.
**trichorhiza* Baker, Handbk. Irid. 165 = Dierama trichorhizum (Baker) N. E. Br.
tricolor Schneev. Ic. t. 39 = Sparaxis tricolor (Schneev.) Ker.
trifolia Lewis, Fl. Pl. S. Afr. 14: t. 543 (1934). p.171
**triticea* Burm. f. Fl. Cap. Prod. 1 = Anapalina triticea (Burm. f.) N. E. Br.
**tubulosa* Burm. f. l. c. = Babiana tubulosa (Burm. f.) Ker.
umbellata Burm. f. l. c. 2 = Dilatris corymbosa Berg.
**undulata* Burm. f. l. c. 1 = Tritonia undulata (Burm. f.) Baker as to name.
uniflora L. Mant. 1: 27 = Sparaxis grandiflora (De la R.) Ker.
variegata Banks ex Schult. Mant. 1: 325. Nomen nudum. = I. monadelpha De la R.
venosa Link. Enum. Hort. Berol. 1: 51. See excluded species.
(*vernalis* Salisb. Prod. 33 = Crocus vernus).
**verrucosa* B. Vog. in Trew, Pl. Rar. t. 24. f. 2 (1784) = Lapeirousia juncea Pourr.
**villosa* Jacq. Ic. t. 284 = Babiana villosula (Gmel.) Ker ex Steud.
villosa Schneev. Ic. t. 16 = Babiana rubrocyanea (Jacq.) Ker.
**villosa* Ait. Hort. Kew. 1: 58 = Babiana villosa (Ait.) Ker.
**villosula* J. F. Gmel. Syst. 110 = Babiana villosula (Gmel.) Ker ex Steud.
**violacea* Banks ex Ker, Bot. Mag. t. 598 = Geissorrhiza rochensis (Ker) Ker var. spithamea (Ker) Ker ex Baker.
virgata Willd. Sp. Pl. 1: 202 = Hexaglottis virgata (Jacq.) Sweet.
virginea Soland. ex Ker in Konig & Sims Ann. Bot. 1: 225 = Hesperantha angusta (Jacq.) Ker or H. bachmannii Baker.
17. viridiflora Lam. Encyc. 3: 340 (1789). p.114
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vitellina Eckl. Top. Verz. 25 = I. maculata L.
(*xiphidium* Loefl. ex Roem. & Schult. Syst. 1: 487 = Xiphidium floribundum).
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A NEW SPECIES OF ERICA FROM THE CALEDON DIVISION: I

Col. H. A. Baker, O.B.E., M.C., Retd.

Erica oliveri H. A. Baker sp. nov. (*Ericaceae-Ericoideae*) Ceramia.

Fruticulus diffusus tenuis vel parvus densus, circa 15 cm. altus. *Rami* tenues minute hispidi. *Folia* 3-nata, petiolis adpressis divaricata, ad 6 mm. longa vel raro longiora, crassa sulcata glabra, setis paucis parvis apice induta. Inflorescentia ternate umbellata, in ramulis foliis valde minutis, nonnihil similibus bracteis instructis. *Pedunculi* 1·5—1·8 cm. longi, glandulis sessilibus minutis: bracteae 3, ovato-lanceolatae remotae, 1 mm. longae, in marginibus glandulis minutis sessilibus instructae et apice setis minutis penicillatae, superiores fere medianae, inferior basin versus posita. *Sepala* lanceolata, 1·5 mm. longa, carinata glabra, marginibus, solum ubi corolla contingentibus, minutis glandulis sessilibus indutis et apice setis penicillata. *Corolla* depresso-globosa, 2 mm. longa 3—3·5 mm. lata, glabra rubicunda valde viscida, glandulis parvis multis: lobi recurvi. *Filamenta* lata et complanata, 1 mm. longa: antherae exsertae subterminales, oblongae glabrae muticae, 1 mm. longae, poro tres partes lobi aequali. *Ovarium* glabrum; stylus exsertus et supra antheras acriter inflexus: stigma capitatum.

A diffuse and slender or small and compact shrublet about 15 cm. high. *Branches* slender, minutely hispid. *Leaves* 3-nate, spreading from adpressed petioles, up to 6 mm. long or rarely longer, somewhat widely spaced, thick and rounded, sulcate, glabrous with a few small bristles at the apex. *Inflorescences* ternately umbellate on modified branchlets bearing minute, bract-like leaves. *Peduncles* 1·5—1·8 cm. long with minute sessile glands; bracts 3, ovate-lanceolate, remote, 1 mm. long edged with minute sessile glands and with an apical tuft of minute bristles, the upper about medial, the lower near the base. *Sepals* lanceolate 1·5 mm. long, keeled, glabrous and edged with minute sessile glands where in contact with the corolla and with an apical tuft of bristles. *Corolla* depressed-globose, 2 mm. long by 3—3·5 mm. wide, pink, glabrous, extremely viscid with numerous small glands. *Filaments* broad and flattened, 1 mm. long: anthers exserted, subterminal, oblong, glabrous, muticous, 1 mm. long, pore $\frac{3}{4}$ the length of the cell. *Ovary* glabrous: style exserted and curved over at right-angles above the anthers; stigma capitate.

CAPE PROVINCE: Bredasdorp and Caledon Divisions on the slopes above Sandie's Glen on the farm "Fairfield" at about 1,500 ft. *Oliver* 1555, holotype in the Bolus Herbarium and 1544, *Baker* 1859, 1862. Flowers in October—November.

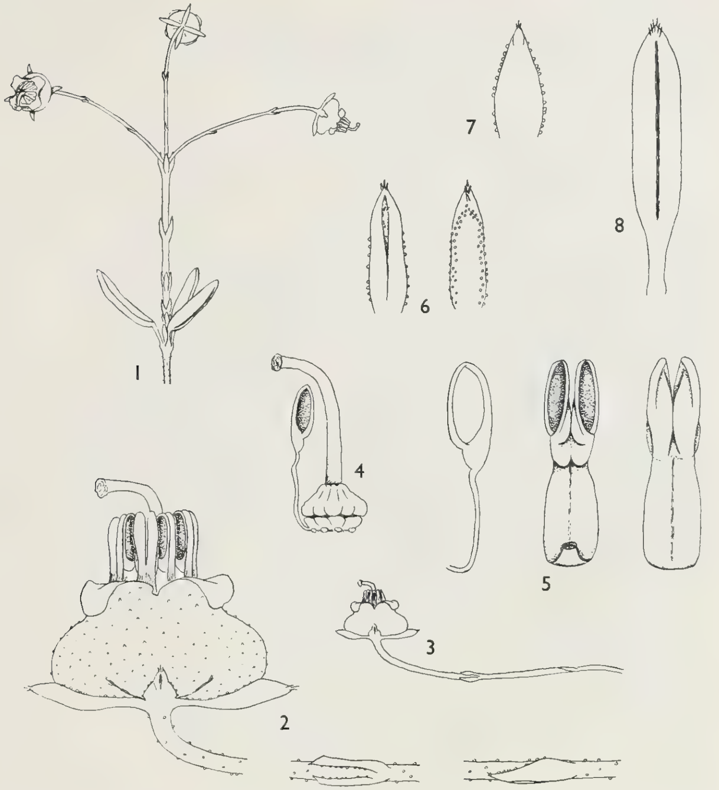
This plant was discovered by Mr. E. G. H. Oliver in a damp kloof at the top of Sandie's Glen in February 1961 when past its prime. On revisiting the site in company with the author in October it was found in the same place not fully mature. Further to the West on the slopes of Paardeberg it was found in profusion and in full flower in the marshy ground bordering the head of a small kloof facing South. It was in association with *E. placentaeflora* and *E. corifolia* in the first locality and with *E. colorans*, *E. placentaeflora*, *E. parviflora* and *E. cumuliflora* in the second.

E. oliveri is remarkable in (1) the very long peduncles and the modified branches with bract-like leaves which subtend the umbels. (2) The sharply curved styles some of which bend even further than a right-angle. (3) Its extreme viscosity.

It is possible that it is confined to this area and to the South-facing seepages at the head of the kloofs running down from the Paardeberg feature, though it was not observed in any of the others visited and, like so many of the marsh-loving species of *Erica*, appears to be locally abundant but, for some reason, very choosy in selecting a particular marsh from many, apparently, similar ones in the same locality.

The species has been named after Mr. E. G. H. Oliver who is making a study of the genus and of the minor genera and has already collected a number of hitherto unknown species and seems destined to add many more to the 600 or so already described.

I should like to thank Capt. T. M. Salter, R.N., for his Latin version and for correction of the manuscript, Mr. Oliver for the drawings and the curators of the Bolus and Compton herbaria for allowing me to use the facilities at their disposal.



Erica oliveri H. A. Baker. *Oliver* 1555. *Del.* E. G. H. Oliver. 1. sprig × 2, 2. flower × 9, 3. flower × $2\frac{1}{2}$, 4. Gynoecium × 9. 5. anthers × 15, 6. sepals × 9, 7. bract × 15, 8. leaf × 9.

A NEW SPECIES OF ERICA FROM THE CALEDON DIVISION: II

Col. H. A. Baker, O.B.E., M.C., Retd.

Erica pauciovulata H. A. Baker sp. nov. (*Ericaceae-Ericoidae*) Leptodendron.

Fruticulus erectus circa 30 cm. altus. *Rami* tenues sed robusti et diffusi quum inter Restionaceas, juniores minute puberuli. *Folia* 3-nata, aliquantum divaricata, arcte imbricata, pedunculos et calyces celantia, lanceolata sulcata glabra, 4 mm. longa, juniora breviter ciliata. *Flores* solitarii terminales in ramulis foliatis. *Pedunculi* brevissimi hispiduli; bracteae 3, approximatae, acuminatae, scariosae. *Sepala* 1·5 mm. longa, imbricata, late ovata et alte convexa, apice propter margines volutos acriter acuminata, glabra, breviter ciliata, scariosa, basin corollae stricte amplectentia. *Corolla* urceolata-campanulata, 5·5—6 mm. longa, glabra, sicca, alte rubricunda, basi circa ovarium disciforme contracta: lobi erecti tubo circa aequantes, demum involute occludentes supra fauces corollae. *Filamenta* lata, acriter ovarium amplectentia: antherae inclusae, subterminales, oblongae minute scabridae muticae, 1·3 mm. longae, poro tertia pars lobi aequali. *Ovarium* disciforme glabrum: cellae 4, plerumque 2-ovulatae: stylus inclusus; stigma capitatum.

An upright plant about 30 cm. high. *Branches* thin, strong and somewhat diffuse when among Restionaceae, the younger minutely puberulous. *Leaves* 3-nate, somewhat spreading, closely imbricate and concealing the peduncles and calyces, lanceolate, sulcate, glabrous, 4 mm. long, the younger ciliate. *Flowers* solitary, terminal on the leafy branchlets. *Peduncles* very short, hispidulous: bracts 3, approximate, acuminate, scarious, coloured. *Sepals* 1·5 mm. long, imbricate, broadly ovate and deeply convex with a sharply acuminate point formed by the rolling-in of the margins, glabrous, shortly ciliate, scarious, coloured and tightly clasping the base of the corolla. *Corolla* urceolate-campanulate, 5·5—6 mm. long, glabrous, dry, reddish pink, the base contracted round the disc-like ovary; lobes erect, about as long as the tube and at length closing in an involute manner over the mouth of the tube. *Filaments* broad and sharply curved round the ovary; anthers included, subterminal, oblong, minutely scabrid, muticous, 1·3 mm. long; pore one-third the length of the cell. *Ovary* disc-shaped, glabrous; cells 4, most usually two-ovulate but, occasionally, more or less; style included; stigma capitate.

CAPE PROVINCE. Caledon Division on the feature Paardeberg on the farm "Fairfield" at about 1,500 ft. *Baker* 1863, holotype in the Bolus Herbarium, *Oliver* 1553. Flowers October—November.

This plant was collected by the author and Mr. E. G. H. Oliver in a small, very wet marsh at the head of a minor kloof. It was in great abundance amongst *Restionaceae.* In this marsh there was no other species of Erica but, nearby, a few outlying plants were found on the edge of another, much dryer, marsh which was full of other *Ericaceae* of entirely different character. It is probably confined to this area.

Erica pauciovulata is most interesting and distinct for the following reasons: (1) The calyx is very tightly clasped round the base of the corolla and ovary; the sepals are deeply convex and imbricate and have a peculiar inrolled point. (2) The ovary contains very few ovules. In those dissected there were mostly two per cell but, occasionally, one or three. Ten in an ovary was the most counted. (3) The manner in which the corolla lobes fold over the mouth after maturity, completely closing it.

To assign this species to a particular section of the subgenus *Euerica* is very difficult. Owing to its glabrous corolla it would be an exception in *Ephebus* in which many of the marsh-loving species are and it does not appear to be related to any of the other species therein. On account of its somewhat diffuse habit it might appear to belong to *Ceramia* but, here again, it would be an exception owing to the length of the corolla and it does not resemble any species in Group 2 of that section. It has, therefore, been assigned to *Leptodendron* in which it has some resemblance to *E. campanulata* and can be fitted into the key without making an exception. It is not, however, a variety of that very variable species. When the time comes to revise the Genus no doubt a more suitable place will be found for it. It is almost impossible to place many of the new species found since Flora Capensis was compiled and revision is required though, very possibly, it is still too soon to do this. A great deal more field work is required before any useful revision will be possible unless some very flexible type of key can be devised which it would not be possible to print in book form.

The author is indebted to Capt. T. M. Salter, R.N., for his Latin version and other helpful assistance and to the curators of the Bolus and Compton Herbaria for placing the facilities at these institutions at his disposal.

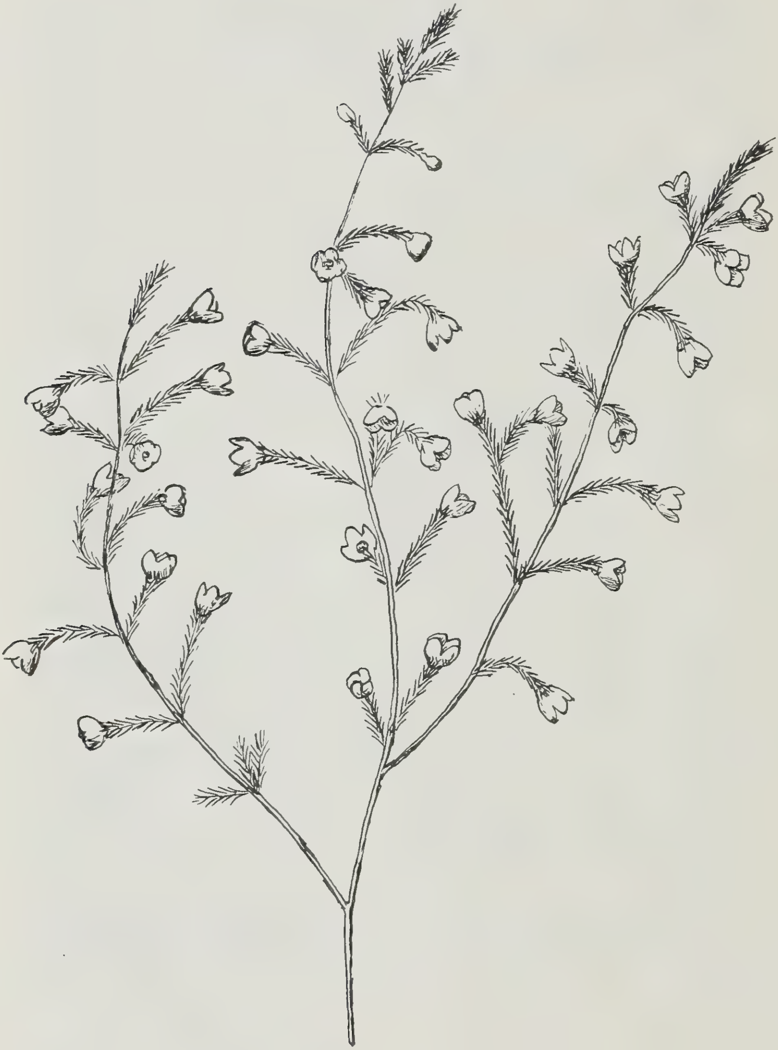


FIG. 1.—*Erica pauciovulata* H. A. Baker (Natural size) *Baker* 1863. *Del.* H. A. Baker.

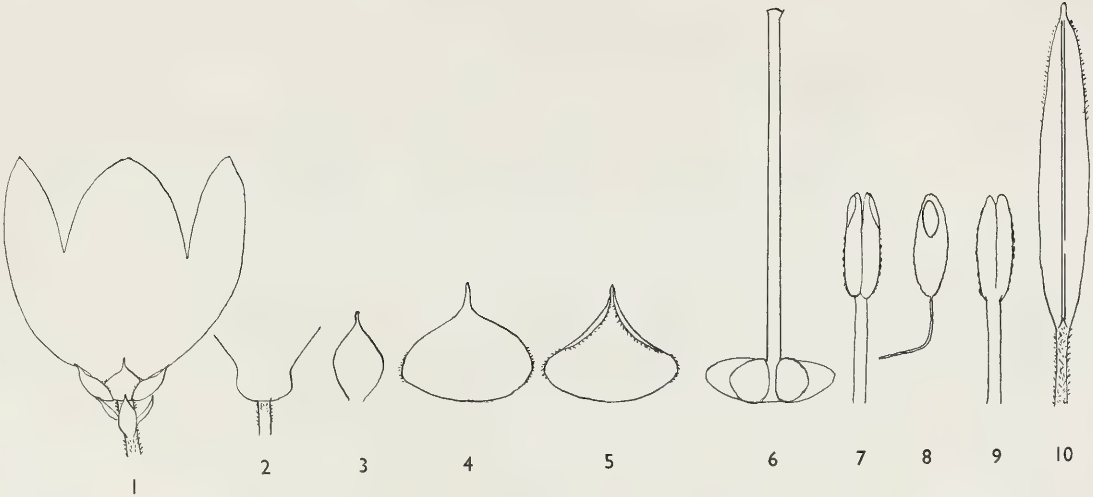


FIG. 2.—*Erica pauciovulata* H. A. Baker. 1. flower, 2. base of corolla × 6, 3. bract, 4. sepal, outside, 5. sepal, inside, 6. gynoecium, 7. anther, front, 8. anther, side, 9. anther, back, 10. leaf. all times 12.

A NEW ALOE FROM ANGOLA

G. W. Reynolds

(With Plates V and VI)

Aloe gossweileri Reynolds. Species nova, affinis *A. palmiformis* Bak. inflorescentia ramosiora, racemis brevioribus obliquis ad horizontalis, floribus subsecundis differt.

Planta frutescens, e basi ramosa, caulibus 1—1·5 m. longis, 3—4 cm. diam.

Folia c. 16, rosulata, ensiformia, saepe 30 cm. longa, 5 cm. lata, patentia vel recurvula; *supra* viridia, leviter canaliculata, immaculata; *subtus* convexa; marginibus dentibus deltoideis 3—4 mm. longis, 15 mm. distantibus armata.

Inflorescentia paniculata, 6—8-ramosa, c. 40 cm. alta. *Pedunculus* basi plano-convexus, 10—12 mm. latus, infra medio divaricate ramosus. *Racemi* 10—15 cm. longi, 5—6 cm. lati, floribus subsecundis. *Bracteae* parvae, ovato-acutae, 3 mm. longae, 2 mm. latae, subscariosae, 3—5-nervatae. *Pedicelli* 10 mm. longi. *Perianthium* coccineum, 30 mm. longum, basi levissime rotundum, circa ovarium 6 mm. diam., hinc levissime constrictum deinde fauces versus levissime ampliatum; *segmenta exteriora* per 10—12 mm. libera, obscure 3-nervata. *Antherae* 1—2 mm. exsertae. *Stigma* demum 2—3 mm. exsertum. *Ovarium* pallide brunneum, 4 mm. longum, 2½ mm. diametro. (Plate V).

Hab. Angola: Benguela Prov., Cuanza Sul, Seles, 7 miles S.E. of Vila Nova de Seles, c. 11° 28′ S., 14° 24′ E., on rocks at 3,400 ft. alt., fl. 15 July, 1961, at Mbabane, Swaziland, Reynolds 9760 holotype (PRE); Vila Nova de Seles, alt. 1,100 m., March, 1930, Gossweiler 13313 (LUA).—A note on this sheet reads, "Stem erect, undivided, up to 2 m. high. Corolla copper-red, lasting only two days. The photo no. 73 of the Carta Fitogeografica de Angola represents this species in its rocky more exposed situation at Nova Seles. Flowers in March."

Our new species is named after the late Mr. John Gossweiler who collected very extensively throughout Angola, and who discovered it in 1930. Gossweiler's *Carta Fitogeográfia de Angola* (1939) is an outstanding contribution to the botany of Angola. Photo 73, at p. 204, depicts a group of shrubby Aloes, without flowers, with the legend "Aloe (angolensis?)" but it is not that species.

In July, 1959, Dr. N. R. Smuts and I found considerable numbers of *A. gossweileri* on rocks 7 miles S.E. of Vila Nova de Seles, but none was in flower then. Copious notes were taken on the spot, photographs secured, and plants collected. When one of these plants flowered in my gardens in 1961, the description was completed.

In the wild state, plants form thickets sometimes several yards across; stems average 1—1½ m. in length, and are branched at ground level, not higher up. An outstanding character is the divaricately branched inflorescence with almost horizontal racemes with subsecund flowers.

A. gossweileri grows in numbers on several rocky hills near Vila Nova de Seles, and also near Amboiva about 35 miles to the east. Further south, plants were found near Bocoio about 50 miles east of Lobito, c. 12° 30′ S., 14° 08′ E., alt. c. 2,800 ft.

A. gossweileri appears to be nearest allied to *A. palmiformis* Bak. near Sa da Bandeira in Huila Province, but it differs chiefly in having a more branched inflorescence with oblique racemes and subsecund flowers. In *A. palmiformis* the inflorescence is only 1—2-branched, the racemes being erect and twice as long.

Description: A shrub forming thickets, with stems averaging 1—1½ m. long, 3—4 cm. diam., branched from base (not higher), ascending or divergent, the apical 10—20 cm. subdensely foliate.

Leaves about 16, rosulate at apex of stem, averaging 30 cm. long, 5 cm. broad at base and gradually attenuate, spreading to slightly recurved; *upper surface* canaliculate, green, mostly without spots or markings; *lower surface* green, rounded; *margins* armed with deltoid teeth up to 3—4 mm. long, 15 mm. apart.

Inflorescence a divaricately 6—8-branched panicle averaging 40 cm. tall.

Peduncle basally flattened and 10—12 mm. broad, divaricately branched well below the middle, the branches spreading to almost horizontal.

Racemes 10—15 cm. long, 5—6 cm. broad, the terminal the longest, the flowers subsecund, buds grey-green tipped, open flowers scarlet.

Bracts ovate-acute, 3 mm. long, 2 mm. broad, thin subscarious, 3—5-nerved.

Pedicels 10 mm. long.

Perianth scarlet, paler at mouth, 30 mm. long, basally slightly rounded, 6 mm. diam. across the ovary, very slightly narrowed above the ovary, thence very slightly enlarging to the throat, the mouth trigonal; *outer segments* free for 10—12 mm., obscurely 3-nerved, paler at margins, the apices subacute, slightly spreading; *inner segments* broader than the outer, with 3 crowded nerves forming a scarlet keel, the apices brownish, more obtuse and more spreading.

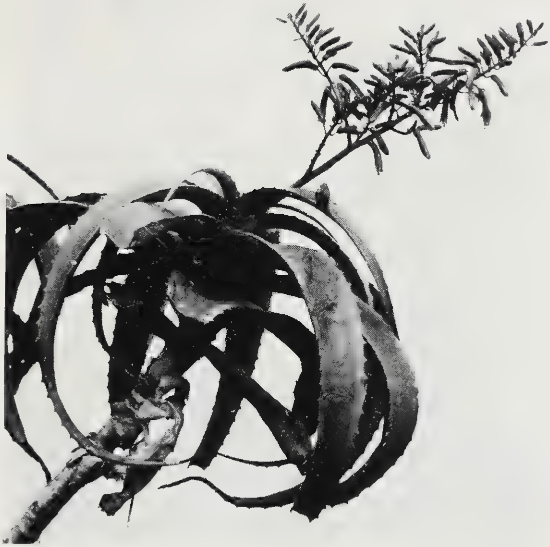


Fig. 1.

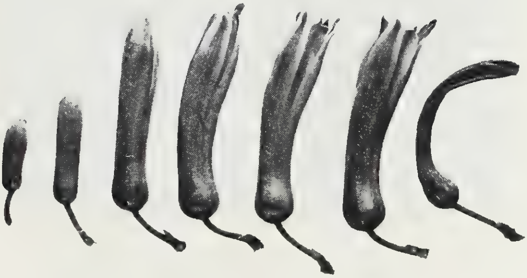


Fig. 2.

Plate V. *Aloe gossweileri* Reynolds.

Fig. 1.—Flowering stem, × 1/6 approx.

Fig. 2.—Flowers 1/1 from bud to post-pollination stage.

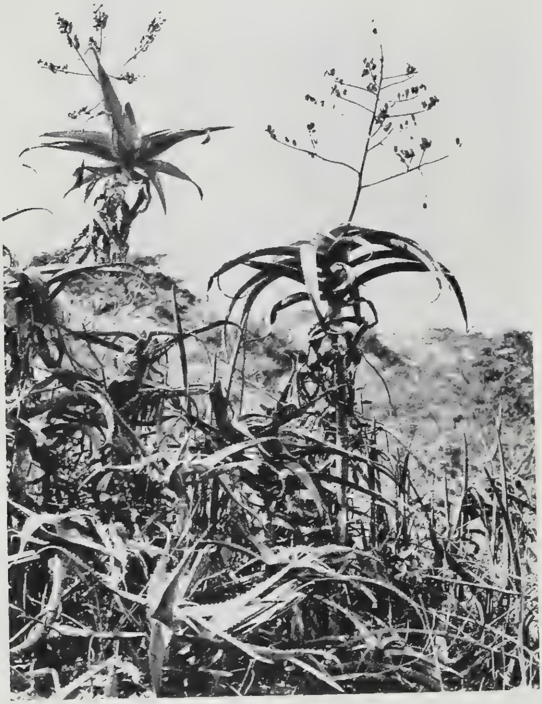


Plate VI. *Aloe gossweileri* Reynolds.

Plants × 1/10 approx., 7 miles S.E. of Vila Nova de Seles, Cuanza Sul, Benguela Prov., Angola. Capsules dehisced and very dry, July 1959.

Filaments pale lemon, the 3 inner narrower and lengthening before the 3 outer, with their *anthers* in turn exserted 1—2 mm. *Stigma* at length exserted 2—3 mm.

Ovary very pale brown, 4 mm. long, $2\frac{1}{2}$ mm. diam.

ACKNOWLEDGMENTS

I am deeply indebted to:

The late Mr. John Gossweiler who was the first to send Aloe plants to me from Angola, and who always readily gave me every assistance in many directions.

Senhor Guilherme Guerra, Engenheiro Agronomo, Director of Agriculture and Forests, Luanda, for an invitation to visit Angola, and for much help while I was there.

Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for photographs, and for the facilities of the National Herbarium, Pretoria.

Dr. N. R. Smuts for considerable assistance during our travels together in Angola.

The South African Council for Scientific and Industrial Research for travelling grants that enabled me to investigate the Aloes in Angola and elsewhere in Africa.

TWO NEW SPECIES OF CARALLUMA FROM SOUTH WESTERN ARABIA

J. J. Lavranos

(With Plates VII and VIII)

Caralluma meintjesiana Lavranos nov. sp. affinis *C. chrysostephanae* (Deflers) Berger et *C. Luntii* N. E. Brown sed ab illas corolla papillata ne pubescente, luteo-viridi, lobis coronae interioris cornu dorsali munitis distinguitur; affinis *C. eremastrum* O. Schwartz sed ab illa lobis corollae revolutis et cornu dorsali loborum coronae interioris discedit.

Caules erecti vel adscendentes, quadranguli, 5—8 cm. longi, 18—22 mm. crassi, glauco-virides, dentibus conicis, acutis armati; flores solitarii ex parte apicale caulium producti; bracteae delto-ideae, 1 mm. longae; pedicelli teretes, glabri, virides, ca. 10 mm. longi, 2 mm. crassi; sepala anguste deltoidea, acuta, reflexa, 3—4 mm. longa; corolla campanulata, ca. 13 mm. longa, inter apices loborum 25 mm. ed expansa 35 mm. lata, a basi 5-fida, lobis elongatis, deltoideis, acutis, ascendentibus, parte apicale paulo deflexis, marginibus revolutis, extus glaucoviridis brunnea maculata, intus flavo-viridis, minute sed dense rubra maculata, glabra, dense papillis minutis induta, rubra marginata; colonna staminalis 4 mm. alta; corona exterior 5 mm. diametro, cyathiformis, in saccis 5, basi rotundatis instructa, laete aurea, extus maculis rubris sparse induta; coronae interioris lobi 1·7 mm. longi, 0·5 mm. lati, primum ascendentes deinde antheras arcte incumbentes sed non conniventes, cornu dorsali valido, extroverto, 1 mm. longo armati, aurei dense maculis rubris induti, apicem emarginati; fructus ca. 55 mm. longi, 7 mm. lati, lineari-lanceolati, apice acutiusculi, extus cani purpurei maculati.

Type Locality : South Western Arabia, Western Aden Protectorate, Audhali Plateau on stony hills near the village of Mukeiras, alt. appr. 7,000 feet (2,100 metres), coll. C. Meintjes, Dec. 1961, fl. Bryanston, Johannesburg, 20 March, 1962, Lavranos 1657 (KEW, Holo-type).

Stems densely tufted, ascending-erect, 4-angled, 5—8 cm. long, 18—22 mm. thick including teeth, glaucous green with darker green and purplish brown spots, leafless; teeth stout, conical, acute, appr. 5 mm. long, spreading horizontally.

Flowers solitary from the upper portion of young stems, when in bud conical.

Bracts deltoid, 1 mm. long, mostly absent.

Pedicel terete, glabrous, green, 10 mm. long, 2 mm. thick but up to 4 mm. thick and marked with purplish brown when in fruit.

Sepals narrowly deltoid, acute, reflexed, 3—4 mm. long.

Corolla campanulate, lobed almost to the centre, appr. 13 mm. long, 25 mm. (when expanded 35 mm.) broad between apices of lobes; *tube* absent; *lobes* appr. 15 mm. long, 2 mm. (when expanded 4·5 mm.) broad at base, deltoid, elongate, gradually tapering to a rather acute apex, ascending-erect, the apical portion very slightly recurved, the margins strongly revolute; *outer surface* glabrous, glaucous green mottled with purplish brown; *inner surface* densely covered with minute conical papillae, not pubescent, greenish yellow with minute blood-red spots, more densely so in a transverse band towards the middle of the lobes, the margins of the lobes blood-red, the apices greenish yellow without spots.

Staminal column 4 mm. high.

Outer corona 5 mm. in diameter, consisting of 5 intergrown concave pouches, intensely golden-yellow with a few irregular blood-red markings on the outer surface, the margins entire.

Inner corona lobes 1·7 mm. long, 0·6 mm. broad, erect for appr. one-third of their length then bent abruptly and incumbent upon but not exceeding the anthers, not connivent, with deltoid, emarginate apices and a stout dorsal horn, 1 mm. long with trucate, emarginate apex, arising from the back of each lobe and spreading outwards, golden yellow, densely marked with minute, elongated, blood-red spots.

Follicles appr. 55 mm. long, 7 mm. broad, linear-lanceolate, somewhat flattened, tapering to a rather acute apex, glaucous-green with purplish spots.

In habit, *C. meintjesiana* appears to be closely allied to *C. chrysostephana* (Deflers) Berger, *C. luntii* N. E. Br. and *C. eremastrum* O. Schwartz, the first of which was collected within a distance of some 50 miles but at a much lower altitude, while the two others were described respectively from Dobaibah in the Hadhramaut and from Hadja in the mountains of the Northern Yemen. In the first two species, however, the corolla is pubescent and purple, at least in the upper portion of the lobes. In *C. eremastrum* the corolla is glabrous, apparently yellow, the lobes are flat, revolute only at their very apex, while it is not stated whether they are papillate or not.

With *C. luntii* and *C. eremastrum* our species shares the feature, unique within the genus, of having a corolla lobed almost to the centre without a tube or even shallow depression at its base.

As in its three allied species, so in *C. meintjesiana* the corona is raised on a stout staminal column. It shares with them the characteristic outer corona which consists of 5 intergrown pouches which, in time, are filled with a sticky, honey-like substance. The corona is golden yellow as in *C. chrysostephana*, while in *C. luntii* it is dark purple.

The structure of the inner corona distinguishes our species from its allies. The inner corona lobes are adnate at the base to the outer corona at the sinuses between the 5 pouches. They are erect for one-third of their length, then bending abruptly inward, closely incumbent upon the anthers. They are not connivent at the centre. At the point where it bends, each lobe bears a stout dorsal horn, pointing outward and at an angle of some 25°, thus giving the inner corona a star-like appearance. This characteristic dorsal horn is not present in the other three related species.

C. meintjesiana, the three species above referred to, and *C. anemoniflora* (Defl.) Berger, appear to belong to a distinct section within the genus. While their habit of growth clearly distinguishes them from the other species in White and Sloane's *pauciflora-quadrangula* group, which do not sucker from the base, the corolla and the structure of the corona appear to differ sufficiently from those of the African *ango* group to allow, in due course, the creation of a new section to include them.

Caralluma plicatiloba Lavranos nov. sp., affinis *C. awdelianae* (Deflers) Berger sed caulibus brevioribus, pubescentibus, corolla pubescente, lobis corollae apicem replicatis et pilis vibratilibus munitis, forma loborum coronae exterioris differt.

Planta humilis, caespitoso-ramosa; caules erecti, obtuse quadranguli vel rarius 5-anguli, 2—10 cm. longi, 7—15 mm. (tenus 25 mm.) crassi, juniores glauco-virides et pubescentes, aetate canescentes et glabri, dentibus muniti rotundatis, cicatricibus foliorum delapsarum conspicuis; folia tenus 2·5 mm. longa, ovato-deltoidea, virida, mox decidua; flores 5—12, breviter pedicellati, in fasciculis lateralibus densis producti; bracteae deltoideae, minutae; pedicelli ca. 2 mm. longi, teretes; sepala ovato-deltoidea, acutiuscula, 1·5 mm. longa; corolla campanulata, ca. 10 mm. longa, 15 mm. diametro, extus glabra, asperiuscula, flavo-viridis dense maculis minutis, brunneo-rubris induta, intus flava, minute pubescens, ubique maculis purpureis, convexis ornata; loborum apices purpurei; margines et summi apices loborum pilis simplicibus albescentibus, 1—1·5 mm. longis ubique sed sparse instructi; tubus 4 mm. longus, 5 mm. latus; lobi adscendentes, apicem paulo recurvi, expansi ovato-deltoidei, apice obtuso, breve bifido, parte inferiore convexuli deinde replicati; corona exterior cyathiformis, lobis fere a basin in segmenta duo linearea, acuta divisis, aurantiaca, maculis rotundatis, purpureis induta; coronae interioris lobi supra antheras incumbentes, 1·1 mm. longi, 0·3 mm. lati, apice rotundati, aurantiaci, purpurei maculati; fructus 9 cm. longi, 7 mm. lati, anguste lanceolati, acutiusculi, virides.

Type Locality: South Western Arabia, Western Aden Protectorate, Audhali Plateau, on stony ground near the village of Mukeiras, alt. appr. 7,000 feet (2,100 metres), coll. C. Meintjes, 26 Dec., 1961, fl. Bryanston, Johannesburg, 11 April, 1962, Lavranos 1654 (KEW, Holotype). Also from Karish, Audhali Plateau, alt. appr. 7,500 feet (2,250 metres), coll. C. Meintjes, 26.12.1961, Lavranos 1655.

Plant succulent, freely branching and re-branching from a main stem, the lateral branches occasionally rooting when in contact with the soil.

Stems erect, 2—10 cm. long, 7—15 mm. (up to 25 mm.) in diameter and somewhat tapering, glaucous green and sparsely pubescent when young, greyish and glabrous with age, obtusely 4- (more rarely 5-) angled with rounded teeth bearing a whitish leaf-scar and a transverse groove above each tooth.

Leaves up to 2·5 mm. long, ovate-deltoid, green, soon deciduous.

Flowers 5—12 in sessile lateral umbels scattered along the upper part of young stems.

Bracts deltoid, minute, mostly absent.

Pedicel appr. 2 mm. long, terete.

Sepals narrowly deltoid, green, 1·5 mm. long.

Corolla campanulate, appr. 10 mm. long, 15 mm. in diameter; *outer surface* glabrous, somewhat rough, with a dark, somewhat raised median nerve on the back of each lobe, yellowish green, densely covered with minute brown-red spots; *inner surface* rich yellow in colour, minutely pubescent and marked with regularly spaced, often confluent, rounded, convex purple spots throughout, purple towards the apices of the lobes, the margins and apical portion of the lobes bearing white, purple-tipped, simple, vibratile hairs 1—1·5 mm. long; *tube* appr. 4 mm. long, 5 mm. broad at the mouth: *lobes* ascending-spreading and somewhat recurved towards the apex, when expanded ovate-deltoid tapering to a broad, shallowly bifid apex, somewhat convex in their lower half, thereafter becoming fully replicate with a rather irregular ridge.

Outer corona 2·5 mm. in diameter, cupular; lobes deeply bifid, the segments erect, linear-acute, 0·4 mm. long, orange-yellow, regularly marked with rounded, purple spots.

Inner corona lobes incumbent upon the anthers but not produced above them, linear, 1·1 mm. long, 0·3 mm. broad, their apices somewhat enlarged, rounded, entire, coloured as the outer corona.

Follicles 9 cm. long, 7 mm. broad, narrowly lanceolate, tapering to a rather acute apex, green.

C. plicatiloba is a close ally of *C. awdeliana* (Deflers) Berger which occurs at low altitudes in the country north-east of Aden as well as on Jebel Shamsan in the Aden Peninsula. From this latter species it differs, however, in being a considerably smaller plant the stems of which are

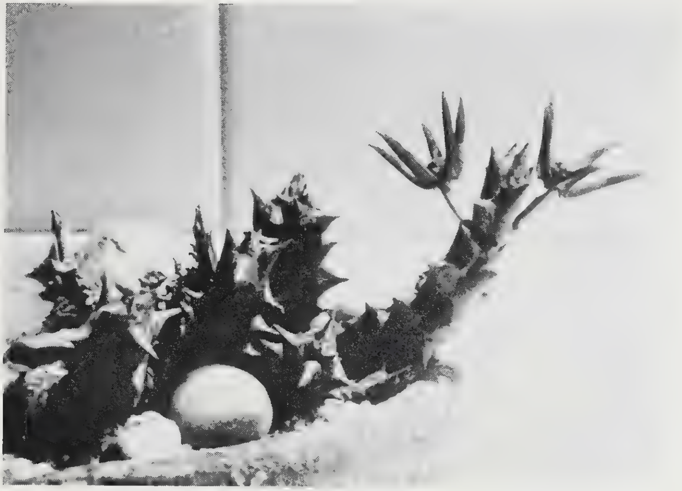


Plate VII.

Fig. 1.—*Caralluma meintjesiana* Lavranos nov. sp. The type plant 3/5 natural size. (*Photo: L. Louis.*)

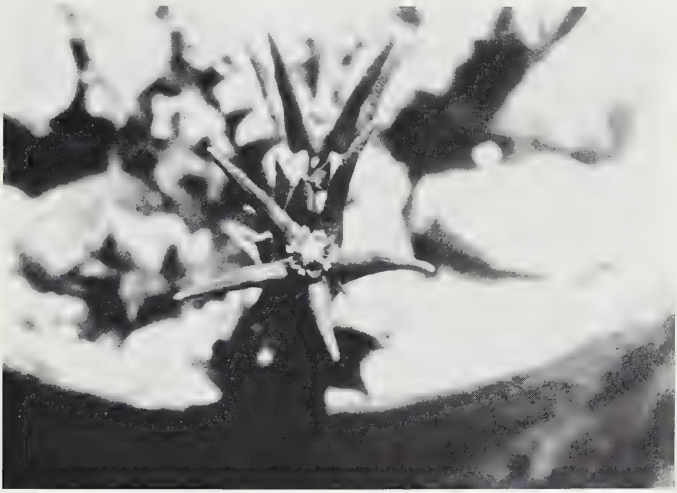


Plate VII.

Fig. 2.—*Caralluma meintjesiana* Lavranos nov. sp. × 1½ actual size. (*Photo: L. Louis.*)

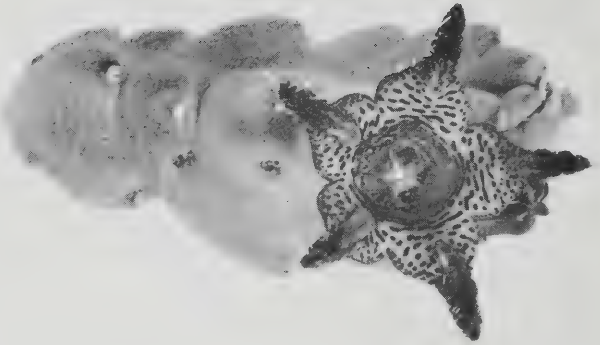


PLATE VIII.

FIG. 1.—*Caralluma plicatiloba* Lavranos nov. sp. Flowering stem × 3·0.
(*Photo: Division of Botany, Pretoria*).

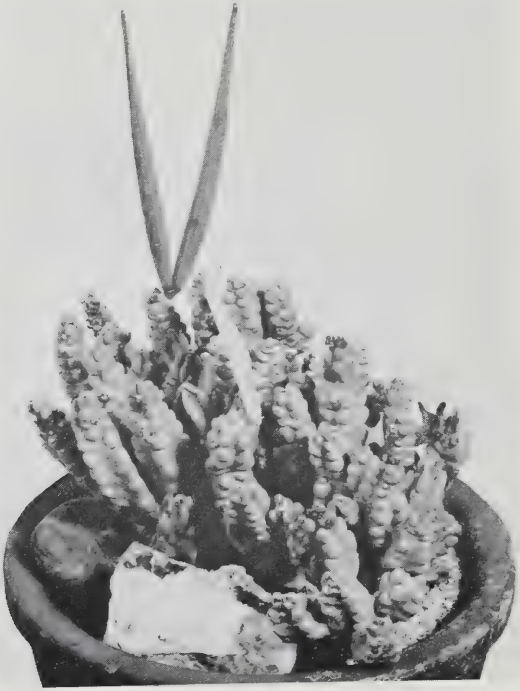


PLATE VIII.

FIG. 2.—*Caralluma plicatiloba* Lavranos nov. sp. The type plant, natural size.
(*Photo: Division of Botany, Pretoria.*)

pubescent when young, a character very rare within the genus. The flowers are produced in umbels from the sides of young stems, whereas in *C. awdeliana* they are invariably borne at the apex of such stems. Moreover, in *C. awdeliana*, the corolla is glabrous, not ciliate at the margins, with a relatively longer tube, the lobes steeply ascending and revolute, not replicate as in our species. In *C. plicatiloba* the outer corona-lobes are divided almost to the base into two linear, erect and not diverging segments. In *C. awdeliana* the inner corona lobes are deep purple.

While in the type plant the follicles are erect and straight, I have in cultivation another plant (Lavranos 1654*bis*) from the same locality, in which they are first diverging at an angle of 150° and thereafter decurved. This plant, which has not as yet flowered, appears, nevertheless, to belong to *C. plicatiloba* as, although more robust, it is virtually indistinguishable in its vegetative characters from that species.

These interesting new species were collected in December, 1961, by Mr. C. C. C. Meintjes, during an excursion to the Audhali Plateau (Kor al Audhilla) in the north-eastern part of the Western Aden Protectorate. They were found growing among rocks on hills in the immediate vicinity of the village of Mukeiras, near the Yemeni border.

Living material was sent to me together with many other interesting plants some of which, in particular one further species of *Caralluma* and two aloes, may prove to be new to science. The collections made by Mr. Meintjes also include known, but none the less interesting species such as, *inter alia*, *C. penicillata* (Defl.) N. E. Br., *C. quadrangula* (Forskal) N. E. Br. and *Aloe sabaea* Schweinf.

Our plants flowered at Bryanston, Johannesburg, on the 20th March and on the 11th April, 1962, respectively, when the present article was compiled and the plants were photographed.

I am indebted to the Chief, Division of Botany, Pretoria, for his permission to use certain books belonging to the Division's library, for much valuable help and advice, and for the photographs of *C. plicatiloba* appearing herewith.

My appreciation for his valuable collections and tireless efforts is hereby expressed to Mr. Clyde Meintjes, after whom the first of these new species is named. The botanical exploration of Southern Arabia is still very incomplete so that the work done by Mr. Meintjes is of particular significance, especially so in view of the affinities of the tropical Arabian flora to that of the opposite shores of the Gulf of Aden, to students of the flora of Tropical Africa.

I also wish to thank Mr. Lionel Louis, of Johannesburg, for the photographs of *C. meintjesiana* which accompany this text.

A NEW VARIETY OF *HAWORTHIA LIMIFOLIA* FROM NATAL

M. B. Bayer

(*College of Agriculture, Cedara*)

(With Plates IX and X)

The typical form of *Haworthia limifolia* is from somewhere west of Delagoa Bay and was described by Marloth (1908). Prof. R. H. Compton has kindly sent me specimens from the Umbuluzi River Valley north of Stegi and also a form from near Gollel on the southern border of Swaziland. Herbarium records show that forms also occur near Barberton; the confluence of the Pongola and Pivaans River 20 miles east of Paulpietersburg; Ndumu, Zululand; Kosi Bay, and the Ubombo Mountains in Zululand. A photograph of a plant collected by Mr. E. R. Harrison 6 miles west of Somkele on the slopes of the Nkonyana Mountains, matches plants collected by me at Ngceba, north of the Black Umfolozi River, between the Umfolozi and Hluhluwe Game Reserves. This form is also reported to occur on the nTsuzi and Ulumbi hills which flank the Umfolozi Reserve on the north and south. Two plants have been collected from this area by Mr. H. Dent. Mr. A. F. Bruyns-Haylett also records it from the Mozaan River Valley between Swaziland and the Pongola River (Plate IX).

In 1956 two unusually robust plants, not agreeing with any previously recorded forms, were collected by the late Mr. F. Bayer in the Nongoma district of Zululand. They belong to the section *Limifoliae* Smith because of the leaves, which are spirally arranged in a tight rosette. However, the tubercles are irregularly arranged on both leaf surfaces and the characteristic transverse lines are not apparent (Plate X). It has been given the varietal name *H. limifolia* var. *gigantea* because of its exceptionally large size. The native name of this plant is "u mathithibala". It is of interest to record also that detached leaves of this plant can produce new plants even up to a year after rooting.

A great deal more information on the distribution and variability of *H. limifolia* is required before the true relationship of the various forms can be determined. The present species concept may comprise either a series of intergrading forms or varieties, or certain composite elements may merit species status. This account of one particular element is presented in the hope of stimulating further interest in this problem.

Haworthia limifolia Marloth var. **gigantea** M. B. Bayer var. nov.

Planta acaulescens, 23 cm. diam., fere 10 cm. alta. *Folia* circa 70 rosulata, spiraliter disposita, fere 9·5 cm. longa, 3·4 cm. lata, ovato-lanceolata, acuminata, supra concava tuberculata, infra convexa tuberculata. *Pedunculus* simplex, 3 mm. diam., racemo incluso 75 cm. longus; pedicelli 2 mm. longi, 1 mm. diam.; perianthium 16 mm. longum.

Plant acaulescent, 23 cm. in diam., about 10 cm. high; stem about 4 cm. thick; stoloniferous. *Leaves* about 70 in a compact rosette, spirally arranged in 9 whorls, patent, recurved, tips ascending, firm, longest leaves 11 cm., average length 9·5 cm., 4 cm. broad at middle, average width 3·4 cm., 0·5 cm. thick, ovate-lanceolate, acuminate; face concave with an oblique marginal longitudinal ridge in upper three-quarters, purplish pink basal quarter, becoming dark green towards tip, upper three-quarters covered with numerous small, irregularly arranged light green tubercles 0·5 mm. in diam., tubercles occasionally arranged in irregular transverse rows, frequently in longitudinal rows towards the tip, tubercles often transversely confluent in lines up to 4 mm. long, nearly white on younger leaves; back convex, usually with a narrow oblique longitudinal depression, purplish pink at base passing to light green in the second quarter, dark green towards the tip, tubercles similar to those on the face but extending nearer to the base; keel oblique in upper third, produced by the depression on the lower leaf surface. *Peduncle* simple, terete 3 mm. in diam., 75 cm. long including the raceme, 32·5 cm. to the first floret, light green below; raceme 43 cm. long, 50 spirally arranged flowers and buds, 4 to 5 open at a time; pedicels 2 mm. long, 1 mm. in diam., erect green; sterile bracts 5, lowest 8 mm. long, 14 cm. from base of peduncle upper bracts 5—6 mm. long, 3—5 cm. apart; fertile bracts 6·5 mm. long, lanceolate, acuminate, green with pellucid white margin, nerve dark brown to reddish brown at tip. Perianth greenish white, 16 mm. long with cylindrical-hexagonal base 3 mm. across, constricted to 2·5 mm. above, not stipitate, ascending; 3 inner segments obtuse, nerve colour green, lower segments channelled, recurved about 90 degrees, patent, upper segment broad, recurved about 45 degrees, 3 outer segments slightly emarginate, tinged with pink at tips, nerve colour green, recurved about 90 degrees; stamens 5—6 mm. long, white. *Ovary* 4 mm. long, 2 mm. in diam., green; style 2 mm. long, light green, straight with a slightly capitate stigma.

Distribution: Natal: Nongoma Distr.; *M. B. Bayer* 112 in National Herbarium, Pretoria (type).

ACKNOWLEDGMENT

I would like to express my thanks to the following people who have assisted me in the presentation of this note:

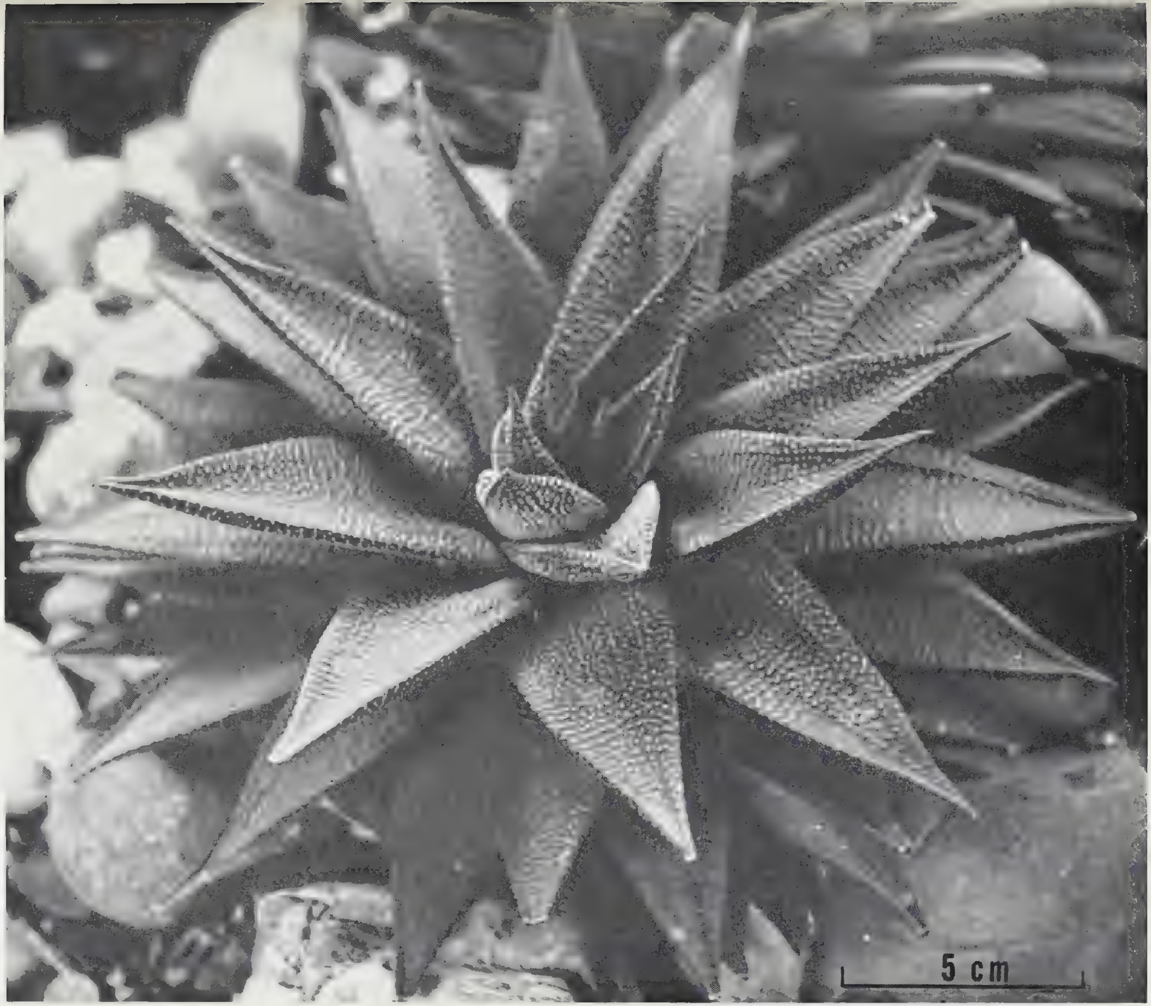


PLATE IX. *Haworthia limifolia* var. *gigantea*. M. B. Bayer.

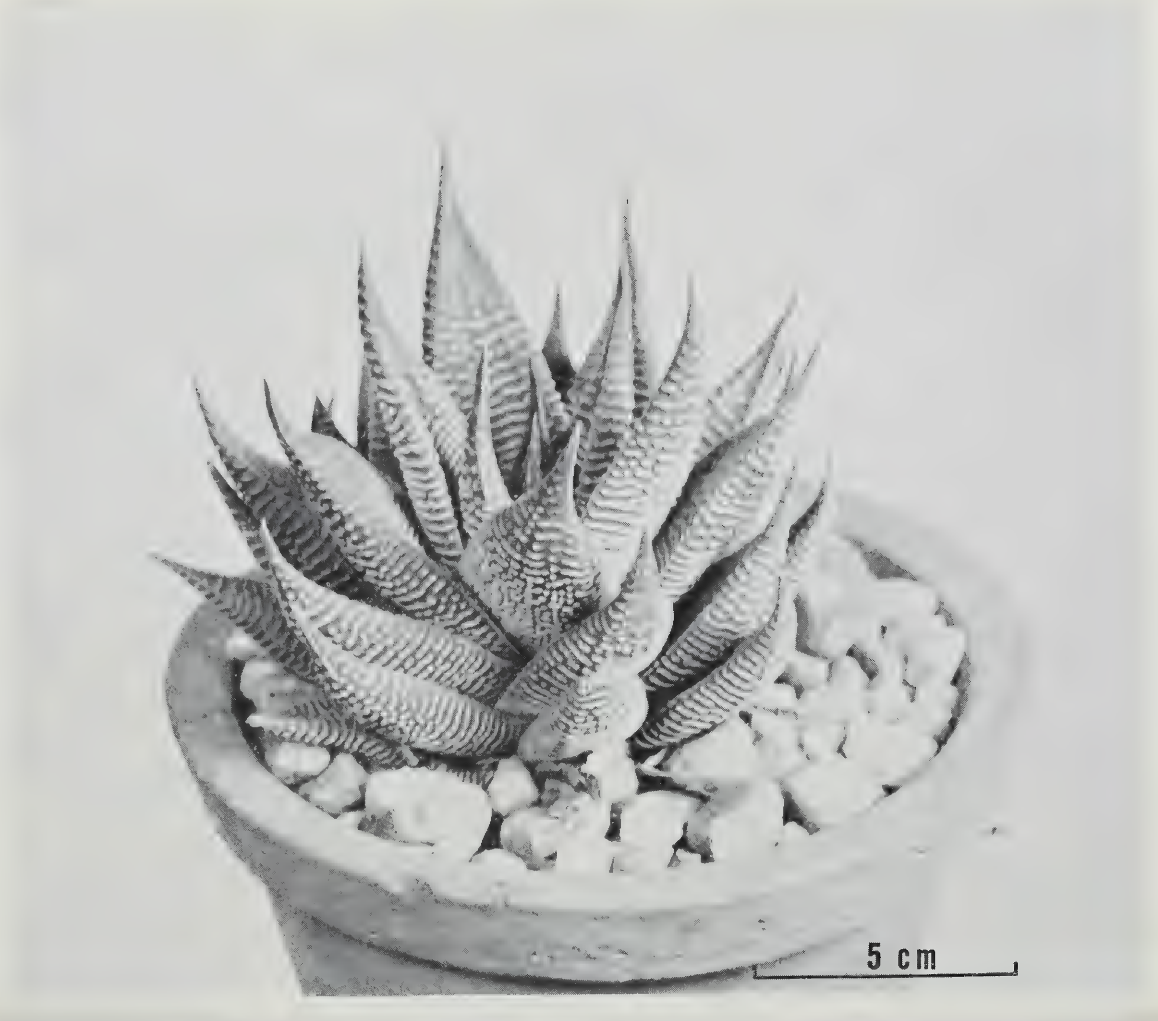


PLATE X. *Haworthia limifolia* Marl. (Mozaan River form). M. B. Bayer

Prof. R. H. Compton of the Swaziland Government Herbarium; Capt. D. R. Keith and Mr. P. T. Forbes of Stegi; Mr. A. F. Bruyns-Haylett of Pietermaritzburg; Prof. A. W. Bayer of the University of Natal, Pietermaritzburg; and particularly Dr. R. A. Dyer of the Division of Botany, Pretoria.

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NOTES ON MESEMBRYANTHEMUM AND ALLIED GENERA

H. M. L. Bolus

Astridia vanheerdei L. Bol. sp. nov.—Planta 1 visa, 19 cm. alta; partes herbaceae glabrae politaeque, glauce virides; caulis 1 cm. diam.; rami primarii ad 8 mm. diam., internodiis inclusis vel ad 2 cm. longis; ramuli floriferi 4-foliati; folia ascendentia, maxima subfalcata, supra plana, acuta vel subobtusa, lat. visa prope apicem ± angustata, eis paris si appressis figuram ovalem vel late ovatam formantibus, lateribus leviter convexis vel altero plano, 3—6·7 cm. longa, basi 1·2—1·6 cm. lata, medio 1·5—2·2 cm. diam.; pedunculi subnulli; bracteae ad 1·8 cm. longae, medio ad 9 mm. diam., margine non, vel vix, excavato; receptaculum late obconicum vel semiglobosum, 4—5 mm. longum, 8—9 mm. diam.; sepala inferne complanata, exteriora acuta, ad 1·2 cm. longa, basi ad 7 mm. lata, interiora prope apicem subulata valdeque compressa, marginata, 8—10 mm. longa, basi 3—5 mm. lata; petala exteriora 2-seriata, e supra medium inferne angustata, obtusa vel rarius acuta, primum sordide rubra, nitentia cum cuprea, deinde vinaceo purpurea, ad 2·5 cm. longa, 1—2 mm. lata, interiora pauca acuminata, 1·1—1·4 cm. longa, ad 0·5 mm. lata; staminodia nulla; stamina 6—7-seriata, erecta conferta, ad 1·1 cm. longa, filamentis omnibus prope basim ciliate papillatis, pallidis, exterioribus superne roseis vel aurantiacis, interioribus prope medium dense papillatis albis, antheris pollineque aureis; ovarii lobi erecti, valde compressi, discum inconspicuum fere attingentes, ad 2 mm. elevati; stigmata 6—7 mm. longa; capsula non visa. Cetera generis.

Cape Prov.: Namaqualand; Richtersveld, "ridge between Anisfontein and Bloeddrift," *P. van Heerde*. Fl. hort. van Heerde, April 1962. N.B.G. 251/62.

In the key to **Astridia** published here in July 1961 (vol. 27: 174) the only glabrous species quoted is **A. longifolia,** from the glabrous form of which **A. vanheerdei** is distinguished chiefly by the glaucous green colour in cultivation of the herbaceous parts, the greater diameter of the leaves and the absence of staminodes. The distinction between the two species may be briefly expressed and be added to the key as follows:

1*a*. Diameter of leaves up to 1 cm.; staminodes present . . *longifolia*
1*b*. Diameter of leaves 1·5—2·2 cm.; staminodes absent *vanheerdei*

Generic characters have not all been repeated in the description of this new species. Mr. van Heerde describes the colour of the petals as being "a dirty cerise when the flower begins to open, changing to a plum-wine colour." The collection was made "several years ago".

Conophytum productum L. Bol. sp. nov. (*Cataphracta*).—Vaginae persistententes anni prioris pergamentaceae vel subcoriaceae, inferne longitudinaliter costatae, inferne brunneae, superne griseae; corpuscula plura visa, fera et culta, obconica, inferne ultra basim pedunculi valde producta, in cultis interdum per dimidium corpusculi itaque vaginae persistentes basi quasi stipitatae, supra (si singula in vagina evoluta, circularia, fera 1 cm., culta 1·4—1·7 cm., longa, 1 cm. et ad 1·6 cm. lata diametroque, ore 2·5—4 mm. longo, labiis leviter tumidis, fossis obscuris; pedunculi prope basim bracteati, 3—7 mm. longi; bracteae virides papillatae, 1·5—2 mm. longae, lobis brevissimis, late obtusis vel subtruncatis; calyx brunneo ruber, 4—6 mm. longus cum tubo 2—3 mm. longo, segmentis 6, aequilongis, 2 mm. longis, vel interdum exterioribus ad 3 mm. longis; corolla 1 cm. longa, tubo cylindrico albo, 4 mm. longo, segmentis ca. 3-seriata, obtusis vel interioribus acutis, supra pallidissime salmoneis, externe pallide roseis, rarius ad 1 mm. latis; stamina ca. 4-seriata, e parum infra medium ad apicem tubi orta, fere omnia exserta, suprema ultra medium segmentorum attingentia, filamentis inferioribus albis, ceteris luteis vel aureis, antheris pollineque aureis; discus conspicuus, fere ad 0·5 mm. altus; ovarium subconice fere ad 0·75 mm. elevatum; stylus nullus; stigmata 6, gracilia, ad 1·5 mm. longa.

Cape Prov.: Namaqualand; "between Eenriet and Steinkopf", Mart. 1960, *H. Hall* 2011. N.B.G. 363/60. Fl. Apr. 1960 et 1962.

C. thudichumii L. Bol. sp. nov. (*Cataphracta*).—Corpuscula 4 visa, vaginis persistentibus pergamentaceis vel subcoriaceis, late obconica, supra plana, fere circularia, dilute glauce viridia, 1·1—1·7 cm. longa, 1·2—1·5 cm. lata diametroque, ore leviter tumido, pallidiore, 3—4 mm. longo, fossis nullis; pedunculi 4—5 mm. longi, a receptaculo vix distincti, basi bracteati, bracteis herbaceis, pro sectione conspicuis, 3 mm. longis, tubo viridi, lobis conspicue rubre papillatis, tubo leviter longioribus, sinu lato vel excavato; receptaculum 1·5 mm. longum, ad 3 mm. diam.; calyx brunneo ruber, ad 7 mm. longus, tubo ad per tres partes incluso, segmentis 6, obtusis vel subacutis, subcarnosis, inter brevissimos in sectione, 1·5—2 mm. longis; corolla 1·9—2·3 cm. longa, tubo fere cylindrico, pallido, 8—10 mm. longo, segmentis ca. 3-seriatis, parum inaequilongis, prope basim leviter angustatis, apice rotundatis, luteis, ad 1 mm., vel parum ultra, latis; stamina ca. 5-seriata, e prope medium ad apicem tubi adnata, saepe 3 mm. longa, pro sectione breviter exserta, antheris pollineque primum luteis; discus conspicuus, segmentis truncatis, 0·5 mm. altus; ovarium late conicum, ad 0·75 mm. elevatum, lobis vix compressis; stylus 0·75 mm. longus; stigmata gracillima, 3 mm. longa.

Cape Prov.: Namaqualand; "¼ mile W. of Walle Kraal on road to Hondeklip Bay", June 1954, *J. Thudichum.* Karoo Garden 55/60. Fl. Feb. 8, 1961.

C. aequatum L. Bol. sp. nov. (*Cataphracta*).—Corpuscula late subobconica, saepissime obliqua, lateribus ± inaequilongis, latere altero magis curvato, supra fere circularia, plana vel leviter convexa, pallide glauce viridia, 1·5—1·8 cm. longa, 1·3—1·7 cm. lata diametroque, ore 3—5 mm. longo, labiis arte appressis itaque lineam leviter elevatam formantibus, in florentibus tantum leviter tumidis tumque fossis obscuris ornatis; pedunculi 4—5 mm. longi, basi bracteati; bracteae subhyalinae, ca. ad 2 mm. longae, lobis latissimis obtusis papillatis, tubo aequilongis, sinu angusto; receptaculum 1·5 mm. longum, ad 3·5 mm. diam.; calyx 7 mm. longus, tubo pallide brunneo, 4 mm. longo, segmentis brunneo rubris subaequalibus; corolla saepissime 2·8 cm. longa in floribus multis visis in plantis pluribus, tubo superne leviter ampliato, pallide lutea, ad 1 cm. longo, segmentis ca. 3-seriatis, prope basim leviter angustatis, acutis vel rarius obtusis, aureis, 1·2—1·8 cm. longis, 0·25—1 mm. latis; stamina ca. 5-seriata, e parum infra medium ad apicem tubi adnata, filamentis luteis vel aureis, ca. ad 5 mm. longis, antheris pollineque pallide luteis; segmenta disci subtruncata; ovarium e disco conice elevatum ad 0·75 mm., lobis vix compressis, dorso complanatis; stylus 1·5 mm. longus; stigmata stylo aequilonga (itaque nomen); capsula 1 visa, infra late obconica, brunnea, conspicue saturate brunneo maculata, 2·5 mm. longa, supra circularis (angulis nullis), plana, suturis non compressis, 5 mm., expansa 9 mm., diam.

Cape Prov.: Namaqualand; Steinkopf, *H. Hall,* N.B.G. 847/48. Fl. Mart. 1962.

C. komkansicum L. Bol. sp. nov. (*Cataphracta*).—Corpuscula latissime obovata, saepe valde obliqua, lateribus inaequilongis, supra plana vel leviter convexa, glauce viridia, 1·8—2 cm. longa diametroque, 1·4—1·8 cm. lata, ore 3—4 mm. longo, labiis in vivis non incrassatis, fossis nullis; pedunculi superne ampliati, 5—8 mm. longi, ad 4 mm. diam., a receptaculo non distincti, parum supra basim bracteati; bracteae ad 4 mm. longae, lobis ca. 1 mm. longis, late obtusae vel altero truncato, sinu latissimo;

receptaculum 1·5—2 mm. longum, 3—4 mm. diam.; calyx brunneo ruber, ad 8 mm. longus, tubo ad 5 mm. longo, fere omnino incluso, segmentis 6, 2—3 mm. longis; corolla 1·6—1·9 cm. longa, tubo cylindrico albo, 8—9 mm. longo, segmentis 3-seriatis, e parum supra medium inferne leviter angustatis, saepius obtusis, inferne pallide, superne saturatiore, luteis vel aurantiacis, exterioribus parum inaequilongis, 0·5—1 mm. latis; stamina 4-seriata, e parum supra medium ad apicem tubi adnata, filamentis albis, ad 5 mm. longis, antheris pollineque primum pallide luteis; discus conspicuus, fere ad 0·75 mm. altus, segmentis truncatis; ovarium e disco conice ad 1 mm. elevatum, lobis dorso complanatis, angulis lineam impressam formantibus; stylus nullus; stigmata 6, gracillima, 3—5 mm. longa.

Cape Prov.: Namaqualand; Komkans, Oct. 1954, *H. Hall.* N.B.G. 898/54. Fl. Apr.1959 et 1962.

Forma, in eodem loco temporeque collecta, corpuscula late subobconica (i.e. lateribus minus convexis) habet. *H. Hall.* N.B.G. 899/54. Fl. Mart. 1961.

C. namiesicum L. Bol. sp. nov. (*Cataphracta*).—Corpuscula 2 visa, fera, latissime obovata vel fere rotundata, supra leviter convexa, 1·3—1·4 cm. longa, parum infra apicem latissima ibique 1·7—1·8 cm. lata, 1·6 cm. diam.; pedunculi 5—6 mm. longi, superne ampliati, inter crassissimos in sectione, apice 4 mm. diam.; bracteae basales, fere omnino connatae, obtusae, sinu lato, 1·5—2 mm. longae; receptaculum 1·5—2 mm. longum, ad 4 mm. diam.; calyx brunneo ruber, magnus pro corolla parva, ad 7 mm. longus, tubo 3—4 mm. longo, segmentis 6, carnosis, siccis subinduratis 2—4 mm. longis; corolla ad 1·1 cm. longa, tubo cylindrico pallido, 5 mm. longo, segmentis ca. 3-seriatis, obtusis luteis, vix ad 1 mm. latis; stamina ca. 5-seriata, e parum supra medium ad apicem tubi orta, pallide straminea vel albida, suprema ultra medium segmentorum exserta, antheris ante dehiscentes ad 1·5 mm. longis; discus profunde divisus, segmentis ca. 21, truncatis, integris vel obscure emarginatis; ovarium supra convexum, altitudinem disci parum excedens, ad 0·75 mm. elevatum; stylus nullus; stigmata 6, angustissime subulata, pro sectione sat crassa, 2 mm. longa; capsula 1 visa, brunnea, saturatiore brunneo maculata, infra brevissima scutellaeformisque (saucer-shaped), ca. 0·75 mm. longa, supra plana, medio tantum levissime elevata, 4 mm., expansa 7 mm. diam; semina late obovata, minuta.

Cape Prov.: Bushmanland; Namies, Apr. 1959, *H. Hall.* N.B.G. 289/59. E feris descriptum.

C. leopardinum (*Derenbergia—Ovigera*) L. Bol. sp. nov.—Ad **C. laetum** L. Bol. et **C. australe** L. Bol. valde affine, sed vagina persistente conspicue brunneo maculata, lateribus corpusculi convexioribus, carina obscura brevique, segmentis calycis stigmatibusque constante 4, praecipue differt.

Plantae plures visae, typica 4 cm. alta, 8 cm. et 11 cm. diam., cum corpusculis lateralibus in eadem vagina nondum florentibus, e corpusculis ca. 60 composita; vagina persistens anni prioris pallide brunnea, e parum infra medium superne conspicue saturate brunneo maculata (itaque nomen); rami primarii in plantis senectis 4 cm. longi, reliquiis deustis dense vestiti; corpuscula late obovata, lateribus superne valde convexis, e prope apicem tantum inconspicue carinata, carina linea purpurea brevi, interdum dimidium apicis fere attingente, ornata, e parum infra medium superne capillaceo papillata, glauce viridia, inconspicue sparseque viridi-punctata, ad 1·2 cm. longa, prope apicem ad 8 mm. lata diametroque, parte pellucida vix visa, ore medio utrimque macula purpurea notato, 1·5—2 mm. longo, labiis leviter ringentibus formantibusque figuram subrhomboideam (aliter lobis nullis), omnino papillatam, papillis densis longioribusque; pedunculi 4—6 mm. longi, prope basim bracteati; bracteae submembranaceae, vix ad 2 mm. longae, lobis truncatis, tubum leviter excedentibus, marginibus contiguis, itaque sinu angustissimo; receptaculum ad 1·5 mm. longum, ad 2 mm. diam.; calyx membranaceus, primum tubo viridi 4-vittato segmentisque viridibus, ad 7 mm. longus segmentis 4, obtusis vel subacutis, subaequalibus, ad 2 mm. longis; corolla 1·4—2·3 cm. longa, tubo superne leviter ampliato, inferne albo, 7—11 mm. longo, segmentis obtusis aureis, exterioribus 2—3-seriatis, obtusis subaequilongis, 1—1·5 mm. latis, interioribus minoribus paucis; stamina ca. 5-seriata, filamentis inferioribus pallidis, superioribus exsertis aureis, antheris pollineque luteis, ovarium conice elevatum ad 0·5 mm., lobis vix compressis, dorso complanatis; stylus aureus, 5—7 mm. longus, stigmatibus 4, 2—3 mm. longis; capsula 1 visa, conspicue brunneo maculata, supra medio acute conice ad 0·75 mm. elevata, ad 4 mm., expansa 7 mm., diam.

Cape Prov.: Namaqualand; "10 miles N. of Soebatsfontein", Nov. 1960, *H. Hall* 2178. N.B.G. 1023/60. Fl. Mart. 1962.

Opthalmophyllum littlewoodii L. Bol. sp. nov.—Vaginae persistentes brunneae vel pallide brunneae; partes herbaceae virides, omnino minutissime nitente papillatae; corpuscula 6 visa, solitaria, cylindrica, in genere minima visa, 1—1·6 cm. longa, lobis fere erectis, 2—3 mm., vel usque ad apicem fenestrae ad 4 mm., longis, basi rotundata ibique 4—6 mm. lata diametroque, interdum prope apicem vaginae leviter constricta ibique 3—4 mm. lata diametroque, apice, cum divergio ad 2 mm., ad 7 mm. diam.; fenestrae conspicue transparentes, convexae, parce verruculosae, "fenestrulis" ("windowlets") in lateribus sat paucis, linearibus vel ovalibus; pedunculi 4—9 mm. longi; bracteae late membranaceo marginatae, obtusae vel acutae, 2·5—8 mm. longae, vagina ad 3 mm. longa, sinu lato; receptaculum ad 3 mm. longum cum tubo ca. 1 mm., ad 2 mm. diam.; calyx 4—6 mm. longus, segmentis 5, acutis vel obtusis, subaequilongis, 2 mm., vel in flore maximo ad 4·5 mm., longis; corolla 8—12 mm. longa, tubo ad 2·5 mm. longo, per 1·5 mm. ad calycem adnato, vel in flore unico fere omnino libero, segmentis 2—3-seriatis, e parum supra medium inferne angustatis, dimidio inferiore albo vel pallido, superiore roseo, ad 1·25 mm. latis; staminodia pauca; stamina 4—5-seriata, e basi ad fere apicem tubi orta, circa partem tertiam segmentorum attingentia, filamentis albis, antheris pollineque luteis; ovarium subconice ad 0·5 mm. elevatum; stylus ca. ad 1 mm. longus; stigmata 5, lutea, 5—7 mm. longa.

Cape Prov.: Namaqualand; "23 miles S. of Viool's Drift, on the Steinkopf Road", Maio 1961, *R. C. Littlewood.* Karoo Garden 302/61. Fl. Mart.—Apr. 1962.

"Growing on a slight undulation of the ground covered with quartz. This is the smallest of the genus I have ever seen and is almost impossible to be seen in its natural habitat without going on one's hands and knees" (*Littlewood*).

This distinct species is the only one to be recorded in the genus with constantly (i.e. in the 4 flowers dissected) 5 calyx-segments and stigmas. The usual number in the genus is 6, and 7 or 5 seem to have occurred in species where the normal number is 6.

O. longitubum L. Bol. sp. nov.—Corpuscula 8 visa, singula vel bina, oblonga vel cylindrica, leviter lateraliter compressa, viridia, dimidio superiore saepissime breviter papillate pubescente, minima 10 mm. longa, 6 mm. lata, 8 mm. diam., cetera 1·5—1·8 cm. longa, 5 mm. et 4 mm. lata, 11 mm. et 9 mm. diam., lobis erectis, 1·5—2 mm. longis, fenestris convexis, conspicue transparentibus, "fenestrulis" ("windowlets") interdum dimidium corpusculi attingentibus; pedunculi 7—9 mm. longi; bracteae carinatae, lat. visae obtusae, 6—7 mm. longae cum vagina 2 mm. longa; receptaculum 3 mm. longum cum tubo 1—1·5 mm., 1·5 mm. diam.; calyx ad 1·2 cm. longus, tubo ad 9 mm. (itaque nomen), segmentis 6, obtusis vel acutis, subaequilongis; corolla 1·4—1·8 cm. longa, tubo 4—6 mm., vel rarius ad 7 mm., longo, omnino ad calycem adnato, segmentis exterioribus ca. 2-seriatis, e parum supra medium inferne angustatis, apice rotundatis vel subtruncatis, pallide roseis vel rarius albis, 1—2 mm. latis; staminodia sat pauca; stamina ca. 4—8-seriata, e parum supra basim fere ad apicem tubi orta, superiora ca. partem tertiam segmentorum attingentia, filamentis albis vel luteis, antheris pollineque luteis; discus inconspicuus; ovarium subconice ad 0·5 mm. elevatum; stylus non bene distinctus, ca. ad 1 mm. longus; stigmata 6, ad 1·2 cm. longa.

Cape Prov.: Bushmanland; "25 miles W. of Goodhouse on the way to Jakkalswater, Maio 1961. *R. C. Littlewood*. Karoo Garden 303/61. Fl. Mart. 1962.—"This was growing about 30 yards from the base of a quartz koppie and only on the south-eastern side" (*Littlewood*).

O. villetii L. Bol. sp. nov.—Corpuscula 4 visa, solitaria, lat. visa oblonga vel obovate oblonga, basi rotundata, 2·2—2·6 cm. longa, medio ad 1·1 cm. lata, prope apicem 1·5 cm. diam. cum divergio 4 mm., vel corpusculum (non florens) 1 subcylindricum 3·2 cm. longum, prope apicem 2 cm. diam. cum divergio 4 mm., lobis 3—7 mm. longis, intus conspicue, dorso minus conspicue, pubescentibus, fenestris convexis; flores diurni; pedunculi 1·2—1·8 cm. longi, bracteis lat. visis obtusis, 1—1·5 cm. longis; receptaculum 6 mm. longum cum tubo 2·5 mm. longo, 3 mm. diam.; calyx 7—8 mm. longus cum tubo ad 3 mm. longo, segmentis 6, obtusis 4—5 mm. longis vel subaequilongis; corolla 1—1·3 cm. longa, tubo 1·5—2 mm. longo, omnino ad calycem adnato, segmentis exterioribus 2—3-seriatis, saepe e medio inferne angustatis, apice rotundatis vel interdum prope apicem leviter angustatis, obtusis, inferne pallide, superne laetissime, roseis vittatisque, 0·5—1·5 mm. latis; staminodia gracilia, obtusa vel acuta, alba, stamina excedentia; stamina 3—4-seriata, fere omnia ex apice tubi orta, 4—6 mm. longa, filamentis saepius luteis, basi inconspicue papillatis, antheris pollineque primum luteis, deinde albis; discus quasi e segmentis 6 crenulatis coalitis compositus; ovarium conice ad 0·75 mm. elevatum; stylus ca. 1 mm. longus; stigmata 10 mm. longa, stamina bene excedentia.

Cape Prov.: Bushmanland; Brakwater, Jul. 1937, *A. C. T. Villet*. N.B.G. 1063/37. Fl. Apr. 1938.

O. vanheerdei L. Bol. sp. nov.—Plantae 3 visae, e corpusculis pluribus compositae; corpuscula lat. visa late obovata vel oblonge obovata, prope medium leviter constricta, deinde superne gradatim ampliata, basi rotundata, subrubre brunnea, 3 cm., vel dorso ad apicem fenestrae 3·4 cm., longa, in medio vaginae 1·3—1·7 cm. lata, apice, cum divergios 3—5 mm., ad 3·3 cm. diam., lobis interdum inaequilongis, intus pubescentibus, ad 5 mm. longis, fenestris strictis vel e dorso ad fissuram leviter declinatis, convexis transparentibus, "fenestrulis" sat pauca, circularia; flores diurni, maximus visus e basi pedunculi ad apicem corollae 3·8 cm. longus; pedunculi ad 1·6 cm. longi, medio bracteati, bracteis, cum vagina 1·5 mm. longa, ad 1·5 cm. longis; receptaculum, cum tubo ad 2 mm.

longo, ad 6 mm. longum, 5—6 mm. diam.; calyx 1·2 cm. longus, tubo 7 mm. longo, segmentis acutis vel obtusis, 5—6 mm. longis, basi 2—3 mm. latis; corolla ad 2 cm. longa cum tubo ad 6 mm. longo, ad calycem per 3 mm. adnato, segmentis exterioribus 2—3-seriatis, e supra medium inferne angustatis, apice rotundatis, albis vel pallide roseis, 0·5—2·25 mm. latis; stamina 6-seriata, e basi fere ad apicem tubi corollae orta, alba, ad 6 mm. longa; ovarium conice ad 0·75 mm. elevatum; stylus nullus vel subnullus; stigmata ad 1·3 cm. longa; capsula infra semiglobosa 6-angulata angulis rotundatis, 3 mm. longa, supra plana, medio vero tantum elevata, 6—8 mm., expansa 1—1·5 cm., diam., pedunculo superne ampliato; semina late piriformia, pallide brunnea, minutissima.

Cape Prov.: Bushmanland; "about 10 miles east of Pofadder", 1957, *P. van Heerde.* Fl. hort. van Heerde Mart.—Apr. et Jun. 1959. N.B.G. 340/59.

O. haramoepense L. Bol. sp. nov.—Plantae 2 visae, altera e corpusculo 1, altera e corpusculis 2, compositae; corpuscula lat. visa ovalia vel oblonge obovata, basi rotundata, apice vaginae leviter constricta, pallide glauce viridia, ad 2·2 cm. longa, medio ad 1·1 cm. lata diametroque, prope apicem loborum, cum divergio 3 mm., ad 1·4 cm. diam., lobis (fenestra exclusa) 2—4 mm. longis, fenestris valde convexis transparentibusque, 4—5 mm. diam.; flores diurni; pedunculi 7—10 mm. longi, bracteis a basi 4 mm. positis, 1·2 cm. longis cum vagina 4 mm. longa, apice pubescentibus; receptaculum ad 5 mm. longum cum tubo 2 mm., ad 3·5 mm. diam.; calyx 1·2 cm. longus cum tubo 6 mm., segmentis acutis vel obtusis, subaequilongis; corolla ad 1·9 cm. longa, tubo ad 7 mm. longo, per 5 mm. ad calycem adnato, segmentis exterioribus ca. 3-seriatis, e parum supra medium inferne angustatis, apice rotundatis vel emarginatis, purpureo roseis, 1—1·5 mm., vel vix ad 2 mm., latis; staminodia alba; stamina 4-seriata, e parum supra basim fere ad apicem tubi orta, breviter exserta, filamentis albis, ad 5 mm. longis, antheris pollineque primum luteis; discus e segmentis ca. 9 compositus; ovarium medio anguste conice fere ad 1 mm. elevatum; stylus ad 4 mm. longus; stigmata 6, stamina bene excedentia, 1 cm. longa.

Cape Prov.: Namaqualand; Haramoep, Apr. 1937, *P. van Heerde.* Bolus Herb. 27139.

O. spathulatum L. Bol. sp. nov.—Corpuscula plura visa, solitaria, vaginis unici per 4 annos persistentibus, suboblonga vel subquadrata, inferne rotundata, parum supra medium leviter constricta, minute papillate pubescentia, 2·4—2·7 cm. longa, apice vaginae 2·1—2·5 cm., basi fenestrarum (sine divergio) ca. ad 2·7 cm., diam., parum infra medium ad 1·4 mm. lata, lobis interiore sat conspicue pubescentibus, ad 5 mm. longis, fenestris convexis, in siccis brunneis, ad 1·1 cm. latis, ad 9 mm. diam., per 1—2 mm., vel in corpusculis florentibus per 7 mm., divergentibus; pedunculi 1—1·5 cm. longi, superne ad per 4 mm. ampliati; bracteae ad 2 cm. longae cum vagina ad 8 mm. longa; receptaculum 5—6 mm. longum cum tubo 1·5—2·5 cm. longo, medio 3—6 mm. diam., inter maxima in genere visa; calyx ad 8 mm. longus, segmentis saepissime 6, vel 8 autem visis, 4—5 mm. longis, basi 1·5—3 mm. latis; corolla 1·6—1·8 cm. longa, tubo ca. 5 mm. longo, ad calycem per 2 mm. adnato, segmentis 2—3-seriatis, exterioribus spathulatis, pallide roseis, inter latissima in genere, ad 3 mm. latis, intimis linearibus, 0·5 mm. latis; staminodia subnulla; stamina 6—7-seriata, breviter exserta, filamentis quasi decurrente ad tubo adnatis, parte libera e parum supra basim fere ad apicem tubi orta, alba, ad 6 mm. longa, antheris pollineque primum luteis, demum albis; discus 0·5 mm. altus; ovarium planum, medio vero conice ad 0·75 elevatum; stylus nullus; stigmata 6, vel 8 autem visa, lutea, ad 1·1 cm. longa.

Forma—In flore unico viso nectarium quasi e glandulis 6, approximatis vel coalitis compositum; ovarii lobi stellate patentibus compressisque.

Cape Prov.: Namaqualand; Ratelkraal, "25 miles from Springbok on the road to Pofadder", *H. Hall.* N.B.G. 1107/50. Fl. Maio 1951.

The following 2 collections also appear to be forms of this species —(1) "23 miles E. of Springbok on the road to Pofadder" *H. Hall.* N.B.G. 1095/50. Fl. Mart. 18, 1951, (2) "On the main road between Springbok and Smorgenskadu, Sept. 19, 1950", *P. H. B. van Breda* 294. Fl. Worcester Veld Reserve, April 1951.

The lower part of the filaments appearing to be decurrently adnate to the corolla-tube does not seem to have been noted in any other species of this genus.

Erepsia hallii L. Bol. sp. nov.—Erecta compacta, conspicue intricate ramosa, 19 cm. alta, ca. 24 cm. diam.; rami primarii saepe decurvati vel patentes, rigidi, asperi ob tuberculas siccas, saepe excavatas, brunneas, aliter albidi, ad 18 cm. longi, internodiis 1—2 cm. longis, ad 2 mm. diam., secondarii saepius alternatim evoluti, saepe arcuate decurvati, 4—8 cm. longi, ultimi floriferi 4—10 mm. longi; partes herbaceae tuberculatae, tuberculis novellis papillas simulantibus, cultae saturate virides; folia primaria erecta, demum patentia, supra plana acuta, acute carinata, lat. visa e supra medium superne angustata, apice uncinate recurva, apiculata, 8—17 mm. longa, 1·5—3 mm. lata diametroque; flores sessiles vel subsessiles, vespere claudentes (fide *Hall*), senectissimi per noctem

aperti, ad 1·5 cm. diam., inter minimos in genere; bracteae 2—4, late ovatae, marginatae, 3—4 mm. longae; receptaculum semiglobosum, 2 mm. longum, 4 mm. diam., tubo brevissimo; sepala 5, acuta, subaequilonga, ad 3 mm., vel in flore altero ad 4 mm., longa, extima apice recurva apiculata, intima ample marginata, membranis brunneo-striatis; petala ca. 4-seriata, sat laxa, alba, ad 5 mm. longa, 0·5—1 mm. lata, exteriora anguste spathulata, interiora sat pauca, linearia; staminodia conice conferta, acuta vel acuminata, viridia, exteriora superne rubre brunnea, interiora ea parum excedentia, ad 4 mm. longa, stamina omnino occultantia; stamina ca. 6-seriata, exteriora fere erecta, ad 2 mm. longa, interiora decurvata, intima ovarium attingentia, filamentis pallide viridibus, antheris pollineque albidis; discus pro genere sat conspicuus; ovarium supra circa marginem planum, lobis superne acute compressis, dorso complanatis, levissimis, ad 0·75 mm. elevatis; stigmata 5, erecta, anguste subulata, ad 2 mm. longa.

Cape Prov.: in dit. Malmesbury; Klipberg, prope Darling, Jun. 22, 1961, *H. Hall* 2229. Fl. Feb.—Mart. 1962. N.B.G. 298/61.

Note.—In 1820 (Rev. pp. 76—79) Haworth divided the genus **Mesembryanthemum** into 69 sections, of which 5 were composed of perennial papulose plants with subterete or terete leaves. The sections were numbered—61 *Digitiflora* (*Splendentia* Salm Dyck), 62 *Juncea*, 63 *Spinulifera* 64, *Trichotoma* and 65 *Noctiflora*. This sequence indicates that they were recognised as closely related groups even in those early days. For more than 120 years later they were found by N. E. Brown all to have 2 supremely important characters in common, namely the central placentation of the ovules and the loculi of the ovary without a covering membrane. He also found distinctive generic characters and in 1925, in a key (amplified in 1928), separated the 3 genera—**Psilocaulon,** based upon § *Juncea*, **Sphalmanthus** on § *Spinulifera*, and **Aridaria** on § *Digitiflora*, § *Trichotoma* and § *Noctiflora*. Two Linnaean species, *M. noctiflorum* and *M. splendens*, are represented in these sections and *M. geniculiflorum* L. should also have been included. Haworth placed it in a section with papulose annuals having subterete leaves, but added—"Perhaps belonging to another section or rather one of its own" ("Forte aliae, potiusve suae sectionis"). Necker in 1790 was nearer the mark when he coupled it with *M. noctiflorum* L. to form his genus *Nycteranthus*. In 1952 Schwantes transferred **Aridaria** to the older genus *Nycteranthus*, and later included **Sphalmanthus,** regarding them as 3 subgenera—*Nycteranthus*, *Neoaridaria* and *Sphalmanthus*. In 1960 the status of Necker's nomenclature was fully discussed at the Nomenclature Congress in Montreal and it was decided that *Nycteranthus* was not a validly

published genus and could not be upheld. **Aridaria,** therefore, with its type-species *M. noctiflora* L. must stand, but restricted to the § *Noctiflora,* which is distinct enough to be separated from the sections *Digitiflora* and *Trichotoma* that seem better placed as subgenera of **Sphalmanthus.** For alternate leaves occasionally occur in them, as opposite ones do in **Sphalmanthus.** But these sections need further revision before a completely satisfactory decision can be made, and the following new species are tentatively placed in **Sphalmanthus** with Haworth's sectional name *Trichotoma* in its masculine plural form *Trichotomi.*

Sphalmanthus stayneri L. Bol. sp. nov. (*Trichotomi*)—Planta erecta glabra, diffuse laxeque ramosa, "16 cm. alta, 58 cm. diam." (*Littlewood*); rami primarii subdecumbentes, pro sectione graciles, lignosi epapillosi, brunnei, internodiis saepius 2—3 cm. longis, ad 3 mm. diam.; partes herbaceae minute papillosae; folia omnia opposita, supra plana, apice dorsoque rotundata, lat. visa superne ampliata, apice rotundata, ad 1·5 cm. longa cum vagina persistente ad 2 mm. longa; cymae saepius laxe irregulariter copioseque ramosae, ad 25-fl. vel ultra, senectae capsulas maturas alabastrasque eo tempore ferentes; flores diurni; pedunculi ultimi saepius 1—2 cm. longi; receptaculum semiglobosum vel globose obconicum, 4 mm. longum, 6—7 mm. diam.; calyx variabilis, 6—11 mm. longus cum tubo 1·5 mm. longo, segmentis 5, obtusis, aequilongis et 5 mm., vel 5—10 mm., vel 7—9 mm., vel 5·8 mm., vel 8—10 mm. longis, basi 1·5—4 mm. latis; corolla 7—8 mm. longa cum tubo 2 mm. longo, segmentis ca. 3-seriatis obtusis, inferne non, vel leviter, angustatis, parum inaequilongis, exterioribus rubris, interioribus aureis vel luteis vel intimis inferne pallidis, apicem versus aureis, 0·25—0·75 mm. latis; staminodia nulla; stamina ca. 6—7-seriata, superiora dimidium corollae fere attingentia, filamentis albis, antheris pollineque primum pallidissime luteis; ovarium e nectario gradatim conice ad 1 mm. elevatum; stigmata 5, angustissime subulata, superne longe attenuata, rubra, ad 2 mm. longa; capsula 6—8 mm. longa, infra obconica vel subclavata, sat conspicue 10-costata, supra per 2 mm. elevata, lobis acute compressis, dorso concavis; semina madida fere semicircularia, parte rotundata minute cristata, saturate grisea, 1·5 mm. longa, 1·25 mm. lata.

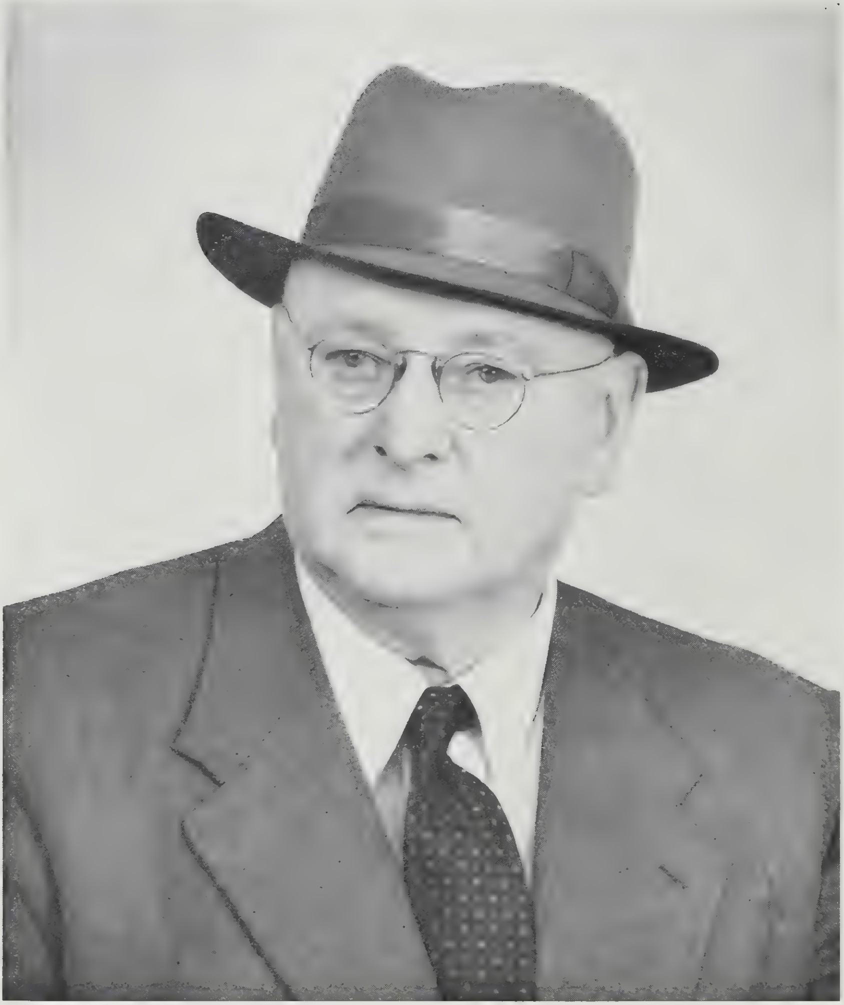
Cape Prov.: in dit. Calvinia; Hantam, Aug. 1961, *F. J. Stayner.* Karoo Garden 128/61. Fl. Feb.—Mart. 1962.

Sphalmanthus hallii L. Bol. sp. nov. (*Trichotomi*)—Planta culta diffuse ramosa, glabra, rami primarii subrigide lignosi, decumbentes leves brunnei, ad 22 cm. longi, ad 6 mm. diam.; rami secundarii ± erecti, ad 20 cm. longi cum cyma ad 8 mm. longa, internodiis fere levibus, saepius 1·5—3 cm. longis; partes herbaceae minutissime crebreque papillatae, virides; folia supra fere plana, superne leviter convexa angustataque, acuminata vel acuta vel subobtusa, dorso rotundata, lat. visa apice rotundata vel prope apicem angustata, obtusa vel abrupte acuta, 1—2·3 cm. longa, vagina persistente vix ad 1 mm. longa, medio ad 2 mm. lata, ad 3 mm. diam.; cymae juveniles 3-fl., seniores irregulariter ad 4-ramosae, ad 8 cm. longae, ad 10 cm. diam. vel ultra; flores diurni; pedunculi ultimi superne ampliati, 2—10 mm. longi; receptaculum subglosum vel subclavatum, 4 mm., vel vix ad 5 mm., longum, apice ad 4 mm. diam.; calyx 1—2 cm. longus cum tubo 1 mm., segmentis 5 vel rarissime 4, saepe acuminatis, valde inaequilongis, 5—9 mm., vel 4—10 mm., vel 5—15 mm., longis, basi 2—4 mm. latis; corolla 7—10 mm. longa cum tubo vix ad 1 mm. longo, segmentis ca. 4-seriatis, in staminodia pallida insensim transeuntibus, obtusis vel acutis vel rarius acuminatis, rubre purpureis, 0·25—0·75 mm. latis; stamina ca. 6-seriata, filamentis albis, ad 5 mm. longis, antheris brevissimis, demum fere circularibus, cum polline aureis; ovarium late conicum, vix ad 1 mm. elevatum, lobis acute compressis, dorso leviter concavis; stigmata 5, angustissime subulata rubra, 1·5—2 mm. longa.

Cape Prov.: Namaqualand; "23 miles W. of Khamieskroon", Nov. 1960, *H. Hall* 2189. N.B.G. 1034/60. Fl. Nov.—Jan., 1961—1962.

Note.—The type specimens of all new species described in this paper are in the Bolus Herbarium, University of Cape Town, Rondebosch.

(*To be continued.*)



S. Garside (1889–1961).

SIDNEY GARSIDE, M.Sc., F.L.S.
(1889—1961)

Sidney Garside was born on January 28, 1889 in Ashton-under-Lyne, an industrial town six miles from Manchester. There he attended the Manchester Grammar School, matriculating in 1907, and there also, at the Victoria University, after taking his B.Sc. degree in 1910, he obtained his M.Sc. degree in June 1911, specializing in Botany.

During this period of his life, apart from his devotion to science and interest in drawing and water-colour painting, he was known as a "champion gymnast" and a "splendid swimmer". His teaching-career began as lecturer in Botany at the Royal Technical College at Salford, very near Manchester, but was soon to be extended to thousands of miles. For, in January 1912, he was appointed the second lecturer in Botany at the Victoria College in Stellenbosch, his subject being mainly plant-physiology. Dr. (Miss) A. V. Duthie, who had been in sole charge of this department for several years previously, was his colleague, and a warm friendship begun there lasted to the end of his life.

Another such link was forged about the same time with genial Mr. Harry Hayes ("Uncle Harry" to many children), who was his efficient "guide and philosopher" as well in all practical business affairs, and whom he appointed as the executor of his estate. As kindred spirits, Mr. Garside soon got into touch with Dr. R. Marloth, and accompanied him on botanical expeditions. Most of his own collecting was done on his bicycle, and the 2,500 of these collections that were purchased by the Kew Herbarium in June 1938 were regarded by that Institution as its "most outstanding acquisition of recent years".*

In December 1920, Mr. Garside returned to England and became lecturer in Botany at Bedford College in June 1921 and Recognized Teacher of the University of London in December 1921, resigning in 1938. Those eighteen years were filled to overflowing. He was elected a Fellow of the Linnaean Society in 1922 and served on its Council for the three years 1935–1937, attended vacation-courses at Geneva in 1925 and 1928, and between 1929 (with the British Association when it met in Cape Town that year) and 1937, made six visits to South Africa in connection with his work on the *Proteaceae* (anatomy and structure of flowers, pollen, etc.).

The Bolus Herbarium was then stationed at Kirstenbosch and the Protea Garden, already well established there, provided ample material.

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* *Kew Bull.* 1938: 507.

He had originally intended this work to be the subject of a thesis for a D.Sc. degree, but gave up the idea and only the small part of it now known as "Garside's Law" was published.† (It is hoped that the remainder of his MS has been preserved and that it may be used in conjunction with further future study of this family.)

In addition to these strictly scientific activities there were endless interests connected with lectures, plays, music, painting (he gained several art certificates at South Kensington), and the many happy hours of browsing in the fascinating bookshops of London. Well do I remember how much my husband and I enjoyed the recounting of some of these delights, when we had him all to ourselves during those visits from England. On such occasions he seemed to be the embodiment of the three men described in Bacon's famous trilogy—"Reading maketh a full man, writing an exact man, and talking a ready man."

It was verily a blessed day for the Bolus Herbarium when Mr. Garside walked into our fine newly acquired building in November 1938 to be warmly welcomed by all his old friends there and to renew his entirely voluntary‡ services to the University of Cape Town. About the same time, Dr. Duthie retired after some thirty-six years of lecturing in the University of Stellenbosch, and it was to Mr. Garside's special care she felt she was entrusting her valuable collection of cryptogams (now amplified and, as it were, enshrined by his work) when she presented them to the Bolus Herbarium, and was supremely happy; while I, well advanced in the latter half of my fifty-two years' tenure of curatorship, rejoiced in the possession of a staunch and able ally. For, from the earliest years after his first arrival in South Africa, he had befriended the Bolus Herbarium in more ways than I can easily enumerate. But I *can* say, with a heart full of gratitude, that his genial interest in its welfare and progress never flagged. Throughout, he was always ready to discuss our difficulties with us—one and all, from the laboratory assistant to the curator—giving us the full benefit of his extensive knowledge, experience and sound judgment, both in practical as well as in scientific matters, never satisfied until he had solved them. In his leisure intervals he would even search for the shops and firms that could best and most reasonably supply us with steel cabinets, best quality cellophane, bookcases and much else—all of which meant a great deal to us, considering our limited time and means.

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†Garside dealt with the arrangement of young spores in the pollen tetrads of *Leucadendron argenteum*. Each pollen grain has three pores, and he found that in the tetrad the pores of three spores are adjacent to one another. This means that there are four points at each of which there are three pores. This principle G. Erdtmann ("Pollen Morphology and Plant Taxonomy"—*Anno* 1952) calls "Garside's Law" as opposed to "Fischer's Law" for other plants, where the pores meet in pairs at six points. Garside also showed that in *Proteaceae* the three pores were not the homologues of the three folds (Colpae) of many other dicotyledons.

‡Except for the short time he was appointed Special Demonstrator in 1943 and until 1946 in the Botany Department.

One of his greatest concerns from the beginning was the Bolus Herbarium Library, where he soon found there were still many gaps among the rare and important works dealing with South African botany that he believed he could help to fill by hunting in the bookshops oversea, and he accordingly made a list of them. When he returned to England in 1920 the successful search began. At the same time he was completing, as far as possible, literature dealing with the cryptogams (*Lichenes* and *Bryophyta*). All these he generously presented to the Bolus Herbarium. They represent the fruits of a labour that no one else available could have yielded and are much prized. The rest of his library was bequeathed to the Bolus Herbarium, and the duplicates of any already there are on permanent loan to the Compton Herbarium at Kirstenbosch.

After the many hours studiously spent in our library, Mr. Garside gained a much deeper insight into the matter of its contents than anyone else had and, as so much of his knowledge was on the tip of his tongue, he could give us information that might have taken us much time that we could ill spare to extract. (He was certainly the "cheerful giver" whom "the Lord loveth"!) His papers relating to historical botany and his "précis" of the works on South African botany compiled for the Van Riebeeck Centenary Festival may be mentioned as some evidence of this intimate knowledge.

In the Herbarium he found an almost negligible number of mosses and lichens, and immediately set to work zealously at building up a collection of cryptogams (excluding Fungi and Algae) that would be available for students. He inspired collectors and named their specimens, and when leading botanists in Europe came to South Africa he entertained them, and his library was at their disposal. As there was no one else on our staff who could possibly find time to assist him, Mr. Garside undertook the arduous and tedious task himself of labelling and arranging the numerous collections that were received—all done with most exemplary precision and neatness. Indeed there was nothing slipshod or hasty in anything he did, be it preparing and serving a tasty meal in his well-appointed home or researching in the morphology of the pollen-grains of *Proteaceae*. But much of his scientific work regrettably remains unpublished for, if it fell short of his ideal of perfection, publication was delayed; and, even though one might plead that as far as it went it *was* perfect and, if recorded would be useful, he seldom, if ever, yielded.

"Mr. Garside was a true scientist," wrote Dr. Duthie, "and all his work was done in a truly religious spirit. He gave unstintingly of his accurate knowledge and goodwill; nothing ever seemed too much trouble." (To such as he was "life is of value only because it can be spent, or given".) His work on *Riccia* and *Riccianella*, revived from earlier years, lasted to the end of his life. He died in Cape Town on November 3, 1961, within a day or two after an operation in the Volkshospitaal.

The most outstanding quality of Sidney Garside's character was his complete sincerity, free from posing or affectation of any kind—one, as the Psalmist sang, "that speaketh the truth in his heart". Self-reliant and composed (one never saw him perturbed or hot and bothered), cheerful, considerate and courteous, he obeyed, no doubt quite unconsciously, the injunctions given to our first parent, *after* the "loss of Eden", by the Archangel Michael—

"Nor love thy Life, nor hate; but what thou liv'st
Live well, how long or short permit to Heav'n:"**

The University contemplated conferring in June 1962 an Honorary Doctorate upon Mr. Garside in grateful recognition of the devoted service he had rendered the Bolus Herbarium, freely and continuously, as Honorary Reader in Systematic Botany (Cryptogams: *Bryophyta and Lichenes*), for so many years. In supporting this view the Curator of the Herbarium, Dr. E. A. Schelpe, wrote to the Principal in 1960:

> "Mr. S. Garside has been in his retirement, a most diligent, albeit unobtrusive, contributor to the enhancement of the international status of a research institute in the University.
>
> "His exceptional knowledge of the older botanical literature has been invaluable in advising on the improvement and extension of the Bolus Herbarium Library. Not only has Mr. Garside given freely of his advice on book purchases but he has presented to the library of the Herbarium botanical works worth several hundreds of pounds. Amongst the most valuable both in rarity and usefulness are pre-Linnaean works such as Ray's 'Historia Plantarum' and a complete set of Plukenet's 'Opera'. His gifts to the Herbarium Library on cryptogamic botany are equally considerable.
>
> "Mr. Garside's work in the Herbarium itself deserves special mention. The fact that the Bolus Herbarium now has the most completely worked and documented collection of bryophytes and lichens of any herbarium in Africa is mostly due to his efforts. His influence has been such that the library appertaining to these sections is probably the best in the continent. His persistence in encouraging local botanical collectors to take an interest in these otherwise neglected plants and his contacts with overseas experts in this field have done much to

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**Milton, "Paradise Lost", Bk. xi, ll. 549–550.

establish the international importance of the bryophyte and lichen collections of the Herbarium."

H. M. L. Bolus and J. P. Jessop.

Bolus Herbarium,
University of Cape Town.

PUBLICATIONS.

1918 Pollen Presentation in *Cryptostemma calendulaceum* R. Br. (*Annals Bolus Herb. vol.* **2,** *pp.* 149–152.)

1922 The Pollination of *Satyrium bicallosum* Thunb. (*Annals Bolus Herb. vol.* **3,** *pp.* 147–154.)

1929 The Structure and Mode of Reproduction of *Siphula tabularis* Ny. (*Trans. Brit. Mycological Soc. vol.* **14,** *pp.* 60–68.)

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1935 A Revision of the Characters of *Neodregea.* (*Kew Bull. No.* 5, *pp.* 292–298.)

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—— Botanical Tour at the Cape. (*Proc. Linn. Soc. London,* 148*th session, pt.* 2 *pp.* 79–81.)

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1. Three annual Species. (*Trans. Royal Soc. S. Africa, vol.* **24,** *pp.* 93–133.)

1938 Some natural *Leucadendron* Hybrids. (*Proc. Linn. Soc. London,* 150*th session, pt.* 2, *pp.* 107–108.)

1940 Duthie, A. V. and S. Garside. Studies in South African Ricciaceae.
2. The annual Species of the Section Ricciella (Concluded). (*Trans. Royal Soc. S. Africa, vol.* **27,** *pp.* 17–28.)

—— Sir J. Barrow's Copy of Aiton's "Hortus Kewensis". (*Journ. S. African Bot. vol.* **vi,** *pp.* 71–72.)

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1950 THE FLORA OF THE CAPE PENINSULA, edited by Adamson, R. S. and Salter, T. M. (Cape Town). By Garside, S.: The Genera *Spiloxene, Pauridium* and *Empodium* (Amaryllidaceae), pp. 214–217.

1951 THE SOUTH AFRICAN FUNGI AND LICHENS, TO THE END OF 1945, by Doidge, E. M. A Review of the above Work, with Notes on the Lichen Flora of South Africa. (*Journ. S. African Bot. vol.* **xvii,** *pp.* 85–89.)

1952 SOUTH AFRICA IN PRINT. (Book Exhibition Committee, Van Riebeeck Festival, Cape Town). By Garside, S.: South African Flora, pp. 148–156. (An annotated, selected list of books on South African Botany, with a brief summary of the history of South African Botany.)

1958 Studies in South African Ricciaceae.
3. A new Species of *Oxymitra.* (*Journ. S. African Bot. vol.* **xxiv,** *pp.* 83–87.)

GONYAULAX POLYGRAMMA STEIN IN CAPE WATERS: A TAXONOMIC PROBLEM RELATED TO DEVELOPMENTAL MORPHOLOGY

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ABSTRACT

During an occurrence of "Red Tide" in False Bay, a large number of individuals of *Gonyaulax polygramma* Stein were examined. They showed a range of variation related to the inferred development morphology of the thecae. This range encompassed the characteristics of many of the species within the "*Polygramma* group". A description and figures of the local population are given, and also observations on the alternation of thecate and encysted stages. The characters of the species within the "*Polygramma* group" are tabulated, and attention is drawn to an apparent developmental series within it which tends to show an affinity between some, if not all, of the species closer than at specific level.

A species of *Gonyaulax* was the causative organism of a "Red Tide" associated with marine fauna mortality in False Bay during March, 1962. Many individuals were examined throughout this period. Exact identification was problematical due to the range of morphology displayed. In general it conformed to the description of *G. polygramma* Stein as elaborated by Kofoid (1911), Lebour (1925) and Schiller (1937), although it was consistently smaller than the figures given. Comparison with other species in the "*Polygramma* group" in Kofoid (1911), and Kofoid and Michener (1911) led to confusion, as the characters by which they are distinguished are variably shown by many individuals of the local population. However, from the wealth of material available it was highly probable that a developmental series within only one species was present.

The following is a diagnosis of the population investigated:

Body subspherical to slightly elongated, varying between 1·1 and 1·3 transdiameters in length. Epitheca broadly angled at the apical-precingular suture, a small truncated apical horn being apparent in some individuals. Hypotheca hemispherical, sometimes fuller on the left side. Girdle descending, variably displaced from 1 to 1·5 girdle widths; deeply impressed, with spiny lists present on older thecae. Ventral area indents the epitheca to a greater or lesser extent; the width between the girdle ends being variable, and a flexure to the right generally exhibited on the epitheca. Posterior ventral plate subcircular, indenting the antapical plate.

Plate formula: $3'$, 0^{a}, $6''$, 6, $6'''$, 1^{p}, $1''''$. Ventral pore on apical $3'$. Precingular $6''$ quadrangular, sometimes almost square. Postcingular $1'''$ small and elongate, varying between 0·4 and 0·8 girdle-widths across. Posterior intercalary large and elongate. No clear subdivisions of the intermediate plate visible.

Surface markings primarily longitudinal. anastomosing of side branches leading to a reticulate appearance on older thecae. No pores visible on the surface except for the ventral pore. Spines occur on the surface, particularly on the hypotheca, becoming pronounced on the older thecae.

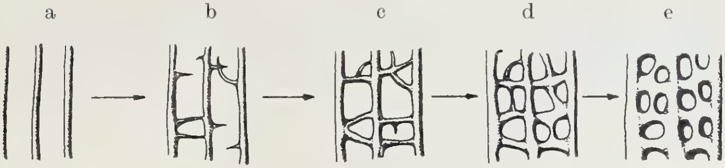
Dimensions: Length 29–48 μ
Transdiameter 22–34 μ
Girdle width 4–5 μ

The longitudinal flagellum extends for twice the length of the cell.

From the material at hand the following stages of the life cycle are inferred:

Ecdysis occurs by a rupture of the apical and precingular plates to release the cell-contents which protrude from the apical pole in much the same way as that figured by Schiller (1937. fig. 301, g.). The released cyst is of a characteristic shape, rounded, and with a protuberance marking the apical pole. The cyst has a predominantly golden-brown colour due to the large number of chromatophores. in this case peripherally arranged, the nucleus appearing as a dark-green, granular area. No dividing individuals were seen, although the cysts often occurred in dense clumps which could have been a result of division. Kofoid and Swezy (1921) have indicated that in autotrophic marine forms encystment commonly provides protection during the non-motile stage accompanying binary or multiple fission. It is likely that it was during encystment that the local autotrophic population underwent fission.

Each cyst forms a new theca, and the impression of the girdle and sulcus becomes apparent (pl. 1, fig. 5). The newly-formed thecae show the plate pattern clearly (pl. 1, figs. 1, 2). Faint lines develop longitudinally, and at this stage no spines, antapical or otherwise, are visible. The body form is rotund. In the intermediate thecate stage (pl. 1, fig. 4) the lines become more marked, and lateral outgrowths connect them to form a reticulum. Linear markings also appear on the girdle plates. Antapical spines develop, the greatest development being apparent in connection with the left antapical spine which becomes markedly longer (up to 7 μ) in most individuals, but not all. The older thecae (pl. 1, fig. 3) show considerable development of the surface reticulation, until in some cases the linear nature can become masked by a thickening of the anastomoses. The girdle markings become reticulate by subsidiary outgrowths, ultimately leading to a porulate appearance.



Text Fig. I

Surface marking series.

a. linear early stage.
b, c. linear-reticulate intermediate stages.
d. reticulate on old thecae.
e. porulate (observed on girdle only).

The marked surface spines of the older thecae appear to be a character limited to the local population. They are most developed on the hypotheca, and around the girdle margin. In some individuals they mask the antapical spines. A small web was sometimes visible associated with the left antapical spine.

The older thecae were more elongate than the younger ones. A strong greenish-white luminescence was apparent when a living sample was agitated, and this was noticeable in the sea when the "Red Tide" occurred.

G. polygramma Stein is chiefly distributed throughout tropical and subtropical waters. Kofoid (1911) refers to its association with "Red Tide", but it has never been recorded as a causative organism of the phenomenon, and never associated with marine fauna mortality.* Karsten (1907) records it from the Indian Ocean, but it is not listed by Hart and Currie (1960) as present in the Benguella Current. The author found it present in small numbers in the cold waters west of Cape Point, and proliferating in the warmer False Bay waters.

It is pertinent at this stage to consider the species within the "*Polygramma* group". Kofoid (1911), in his monograph on the genus *Gonyaulax* described five species, three being added by Kofoid and Michener (1911). They all possess the same plate formula, and are characterised by predominantly linear longitudinal markings. The eight species can be arranged in a series of increasing size which is combined with an elongation of form, increasing antapical symmetry and an increasing density of surface markings. Kofoid noted this series, but did not draw attention to the increasing density of surface markings as it is possible that he considered the porulate condition of *G. kofoidi* Pavillard and *G. pacifica* Kofoid as a simpler state than the more reticulate species. However, from the present author's observations on the development of surface markings, particularly on the girdle which culminate in a porulate appearance (Text fig. 1), it would seem possible to infer that the porulate condition constitutes an end-point in an increase of surface reticulation without the formation of spines.

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* Since the paper was submitted one reference to its being highly destructive to oyster beds in Japan has been found. Anon. (1933), *Nat.* 132 : 253.

TABLE I

Characters of the species within the "Polygramma" series.
(Figures compiled from the referred literature.)

(t) — quoted in text of Kofoid (1911)
(d) = quoted in diagnoses in Kofoid (1911)

Species	Length μ (L)	Trans-diam. μ (TD)	$\frac{L}{TD}$	Markings
G. minuta Kof. and Mich.	20–25	18–20	1·1	linear
G. turbynei Mur. and Whit.	32–47	26–37	1·16	lin.-reticulate
G. scrippsae Kofoid	29–50	27–40	1·12–1·15	lin.-reticulate
G. pavillardi Kof. and Mich.	48	44	1·1	lin.-reticulate
G. polygramma Stein	42–75	38–48	1·2–1·5	lin.-reticulate
G. reticulata Kof. and Mich.	50–65	45–50	1·3	reticulate
G. kofoidi Pavillard	77–110 (t)		1·5–2·0 (t)	
	100–110 (d)	62–65	1·65 (d)	poroid
G. pacifica Kofoid	106–179 (t)		1·5–1·75 (t)	poroid
	148–167 (d)	72–88	1·6–2·0 (d)	

According to Kofoid the species within the group can be separated from each other on the combined grounds of dimensions, displacement of the girdle, the shape of certain plates, the presence or absence of antapical spines, and the pattern and degree of surface markings. In view of the continuum in size and development of surface markings as shown by the arrangement in Table I the presence of a single-species complex is strongly suggested. This view is strengthened by the present author's observations which show great variability among the other factors in the local population considered referable to a single species.

Kofoid (1911, p. 231) admits infraspecific variability in *G. polygramma*, drawing attention to the existence of variants within the species grading towards adjacent members of the series: "This widely distributed species varies toward both *G. turbynei*, the next smallest member of the series, and towards *G. kofoidi* and *G. pacifica*, the longer ones". He maintains that *G. turbynei* can be distinguished from *G. polygramma* by its lack of antapical spines and lack of an apical horn. However, both these factors were variable in the population investigated. He separates *G. polygramma*, *G. kofoidi*, and *G. pacifica* by a comparison of size, shape of the antapex, and width of the posterior intercalary plate, all factors manifesting the graded change shown by the arrangement of the series. Schiller (1937) suggested the possibility of *G. kofoidi* and *G. pacifica* being the same species.

There would appear to be a close affinity between those species discussed above, and this affinity would appear to embrace *G. minuta*, *G. pavillardi*, and *G. reticulata* on the same grounds. Each of the three latter species was described from one station only, with no illustrations provided, and in the case of *G. pavillardi*, with no size range provided.

The present author's choice of *G. polygramma* Stein as the name for the local species is based on the fact that although it resembles *G. turbynei* Murray and Whitting in its early stages of development, and also *G. pavillardi* Kofoid and *G. reticulata* Kofoid at other stages, it most resembles *G. polygramma* in its plate pattern, shape of significant plates, reticulation, antapical spine development, and ecdysis; allowing for variation within the group at a subspecific level. *G. polygramma* is the earliest described species within the group.

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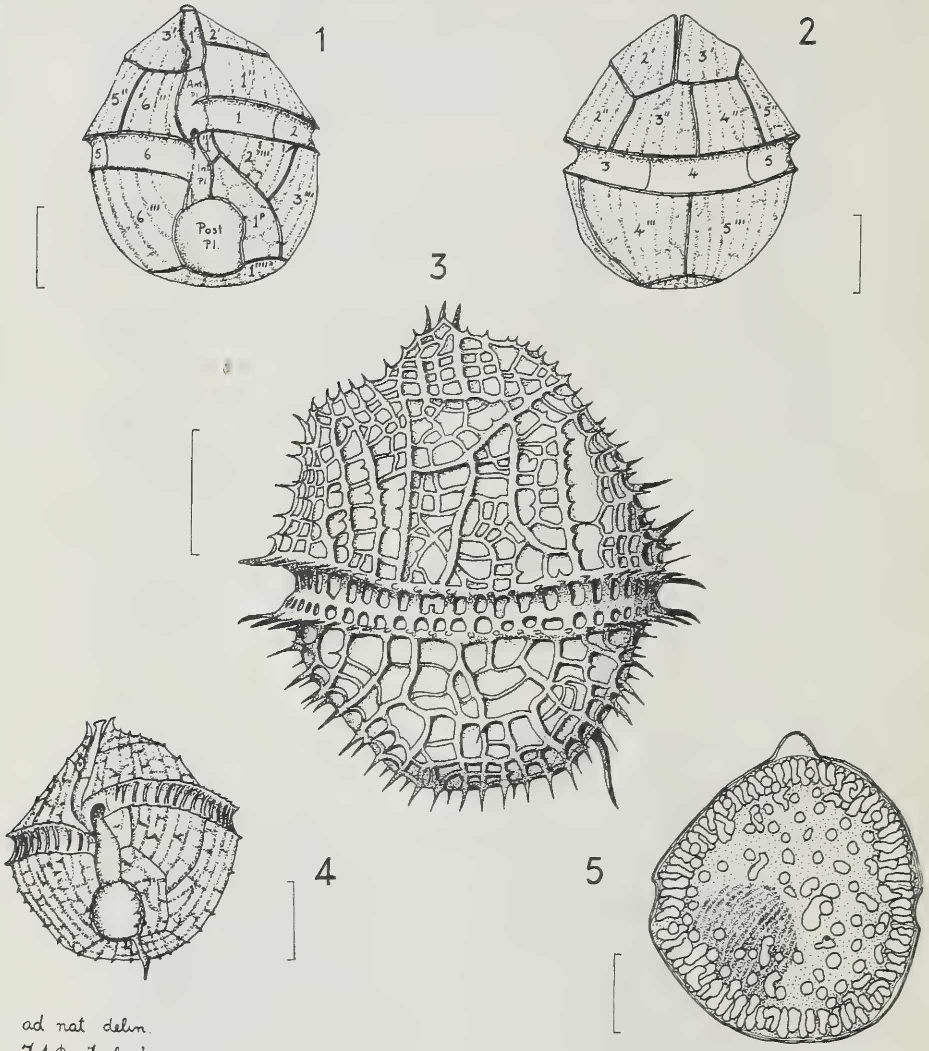

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FJR Taylor '62

PLATE I
(Scale represents 10 μ)

FIG. 1.—Ventral view of young theca, showing plates.
FIG. 2.—Dorsal view of same.
FIG. 3.—Older spiny theca, left side.
FIG. 4.—Ventral view, intermediate stage.
FIG. 5.—Cyst showing new theca developing.

THE SOUTH AFRICAN SPECIES OF AIZOACEAE:
XII. *SESUVIUM*, *TRIANTHEMA* AND *ZALEYA*

R. S. Adamson

The three genera are closely related and form part of a group within the family characterised by flowers with a superior ovary which is quite free from the perianth and which develops into a capsule with circumscissile dehiscence. The plants are herbaceous with opposite usually succulent leaves. For more than a century this group has been regarded as constituting a distinct tribe or subtribe. By most of the older writers it has been associated with Portulacaceae. The distribution is pantropical with extensions to warm temperate regions especially in the Southern hemisphere. In Africa almost all writers have recognised two genera, *Sesuvium* and *Trianthema*, as belonging to it. Both these genera were founded by Linnaeus and though closely related have been maintained as separate units by all subsequent writers. Indeed, a few have regarded them as belonging to separate families. (eg. D.Don Gen. Syst.3: 72 & 153. 1834).

With extensions of the area of botanical exploration in Africa, together with more intensive collecting, the number of described species has been considerably increased. At the same time there has arisen a certain degree of confusion as to the real limits of generic separation. Species have been variously assigned to one or the other. This confusion has been the result of reliance for generic discrimination on features that have been shown to be unreliable. To avoid this Phillips (Gen. S.Afr. Pl. ed. 2. 292. 1951) has suggested that the two genera should be merged into one, a suggestion that he himself does not adopt. Such a reduction to one comprehensive genus might be supported on grounds of convenience but is opposed to all historical usage and would involve a number of name changes, including the epithet of one or the other of the type species of the two generally accepted genera.

Recently Jeffrey (Kew Bull. 1960. 237) has resolved the generic confusion by the recognition of three genera instead of two. The genera so redefined are largely separated on the form and structure of the ovary and fruit and the three appear as relatively uniform and separable units. Jeffrey's scheme is elaborated in his revision of the species occurring in East Africa (Aizoaceae Fl. Trop. East Af. 1961) and is adopted for the S. African species in this account.

The only previous general accounts of the S. African species are those of Sonder in Fl. Cap. 2. 1862, and of Oliver in Fl. Trop. Afr. 2. 1871. Both were written at a time when the floras of the territories adjoining South Africa were almost unknown and were necessarily based on a very limited supply of material.

In this account of the S. African species a rather conservative attitude is taken on specific discrimination. All the species are at the southern limit of the geographical range of the genera. Several described local species are reduced to the status of varieties of more widespread species pending more detailed investigations.

I take this opportunity of returning sincere thanks to Mr. C. Jeffrey of Kew for much help and for many suggestions.

Subtribe **SESUVIINEAE**

K. Müll. Bot. Jahrb. 42. Beibl. 97 : 94. 1908.

Sesuvieae Reichb. Handb. 237. 1837.

Fenzl. Ann. Wien. Mus. 2 : 289. 1859 (Sub Portulacaceae).

Herbs, mostly prostrate and succulent. Stems with elongated internodes. Leaves opposite, exstipulate, usually petiolate. Perianth segments united at least at the base. Stamens attached to the perianth. Ovary superior, free from the perianth, 1- to 5-chambered: styles 1—5. Fruit a capsule opening by a transverse split.

Key to the Genera

1. Styles 2—5: ovary 2—5 chambered.
    2. Lid of fruit conical, thin-walled, falling as a whole: seeds many .. .. 1. *Sesuvium.*
    2. Lid of fruit truncate, thickened, separating as two valves: seeds 4 .. .. 3. *Zaleya.*

1. Style 1: ovary 1 or incompletely 2-chambered: lid with a thickened band: seeds 2 or 4 .. .. 2. *Trianthema.*

1. SESUVIUM.

L. Syst. Veg. ed. 10. 1058. 1759.

Diplochonium Fenzl. Nov. Stirp. Dec. 57. 1839; Ann. Wien. Mus. 2: 291. 1839.

Pyxipoma Fenzl Ann. Wien. Mus. 2: 293. 1839.

Psammanthe Hance Walp. Ann. 2: 659. 1852.

Halimus O. Kuntze Rev. Gen. 1: 263. 1891.

Prostrate succulent herbs. Leaf pairs usually unequal. Flowers usually solitary, in the forks of the stem or apparently axillary. Perianth segments 5, spreading, with a solid mucro behind the tip. Stamens 5 to numerous, where more than 5 often united in bunches or all together. Ovary 3- or 5-chambered, rarely 2: styles 2—5; ovules many, or more than 4. Fruit conical, the lid pointed, thin-walled, the lower part thickened below the line of dehiscence or all over. Seeds reniform or rounded with a prominent hilum.

The type species is *S. portulacastrum* L.

Throughout the tropics and subtropics in dry regions especially near the sea. In southern Africa confined to the northern parts especially S. W. Africa.

Key to the Species

1. Flowers sessile or nearly so: perianth segments united
for about a third their length .. .. 1. *sesuvioides.*

1. Flowers pedunculate: perianth segments almost free 2. *portulacastrum.*

1. **S. sesuvioides** (Fenzl) Verdcourt Kew Bull. 1957. 349.

Diplochonium sesuvioides Fenzl Nov. Stirp. Dec. 58. 1839, Ann. Wien. Mus. 2: 291, 1839.

Trianthema hydaspica Edgew. J. Linn. Soc. Bot. 6: 203. 1862.

S. digynum Welw. ex Oliver Fl. Trop. Afr. 2: 586. 1871.

T. polysperma Hochst ex Oliv. l.c.

Halimus sesuvioides (Fenzl) O. Kuntze Rev. Gen. 1: 263. 1891.

S. hoepfnerianum Schinz Bull. Herb. Boiss. 5. App. 3: 75. 1897.

T. salarium Bremekamp Ann. Tvl. Mus. 15, 2: 239. 1933.

Branching prostrate herb sometimes slightly woody at the base. Stems pale coloured, stout, up to 50 cm. long, coarsely papulose at the tips, but becoming rough. Leaves slightly succulent, elliptical-oblong, the blades 0.7—2 cm. long, 0.3—1 cm. wide, often folded back on the midbrib in the younger stages; petioles 2—5 mm. long. Flowers mostly solitary, sessile or nearly so, 0.6—1.2 cm. long. Perianth segments united for about a third to half their length, the lobes acute with a mucro about 2—4 mm. long and acute downwardly directed projections between. Stamens 5—10 or more, free. Ovary 2-chambered: styles 2 or rarely 3. Fruit pointed, the lower part thickened below the line of dehiscence or all over. Seeds tuberculate.

The type *Drege* 2938 W.

Among rocks, especially in river beds. Throughout tropical Africa in the south confined to the northernmost parts.

Variable in size. A detailed study of the forms throughout their range is needed before any can be separated. *T. salarium* Bremekamp seems to differ only in having 10—15, commonly 13 stamens. The young parts are coarsely papulose, later the vesicles dry and become rough, older parts may become almost smooth.

CAPE: Namaqualand. Orange Riv. *Drege; Pearson* 6027; Anisfontein *Pillans* 5013.

S. W. AFRICA. Rehoboth. *Strey* 2529, 2192; Okavango *de Winter* & *Marais* 4495; Amboland *Rautanen* 560; Grootfontein *de Winter* 2986; Kahanstal *Dinter* 8190; Charlie's Puts *de Winter* 3577B; Waterberg *Bradfield* 185; Kleinfontein *Dinter* 4151; Brandberg *Liebenberg* 4977; Haikamschab *Lindney*; Hereroland *Schinz* 208; Gt. Namaqualand *Schenk* 16; "S.W.A." *Galpin & Pearson* 7676.

TVL. Zoutpansberg. Salt Pan *Bremekamp & Schweickerdt* 232; Hammanskraal *Leeman*.

2. **S. portulacastrum** (L.) L. Syst. Veg. ed. 10. 1058, 1759.

Portulaca portulacastrum L. Sp. Pl. 446. 1753.
S. repens Willd. Enum. 521. 1806.
S. pedunculatum Pers. Syn. 2: 39. 1807.
S. revolutum Pers. l.c.
S. congense Welw. ex Oliv. Fl. Trop. Afr. 2: 586. 1871.

Prostrate succulent, rooting at the nodes. Stems thick, often purple. Leaves oblong or oblanceolate, 3—8 cm. long, 0.2—0.7 cm. wide, narrowed at the base to a short petiole. Flowers solitary, pedunculate, red or purple. Peduncle 0.5—2 cm. long. Perianth 0.5—1.5 cm. long, the segments united only at the base, less than a third their length, with a mucro 4—6 mm. long at the tip. Carpels and styles 3, less often 5. Seeds many.

The type is *Hermann* BM.SL. (Herm. Parad. 262. t212).

Tropical coasts usually on sand. Recorded from Angola and from Portuguese East Africa but not, so far, from S. Africa.

2. TRIANTHEMA.

L. Sp. Pl. 223, 1753; Gen. Pl. ed. 5: 105. 1754.
Papularia Forsk. Fl. Aeg-Arab. 69. 1775.
Ancistrostigma Fenzl Ann. Wien. Mus. 2: 293. 1839.

Prostrate herbs, often annual, partially succulent. Stem with long often unequal internodes. Leaves opposite but usually unequal, petiolate, with a membranous expanded sheath. Flowers solitary or more often in groups. Perianth segments distinctly united at the base, the lobes ascending, mucronate behind the tip. Stamens 5—10, attached to the perianth. Ovary 1- or incompletely 2-chambered: style 1; stigma 2-lobed, ovules few. Fruit enclosed by the perianth, thin-walled, the lid more or less truncate, with thickened bands, the tip thin and often depressed. Seeds 2 or 4.

The type species is *T. portulacastrum* L.

Dry regions in the tropics and subtropics especially in Australia. In Africa throughout the tropics and extending southwards to the northern parts of South Africa.

The species fall under two subgenera.

KEY TO THE SUB-GENERA

1. Ovules 4: flowers mostly solitary .. .. *Trianthema.*
1. Ovules 2, superposed: flowers in groups: leaves mostly small *Papularia.*

Subgen. 1. **TRIANTHEMA**

Flowers mostly solitary. Ovary with 4 ovules. Leaves broadly ovate.

Only species *T. portulacastrum* L.

1. **T. portulacastrum** L. Sp. Pl. 223. 1753.

T. monogyna L. Mant. 1: 69. 1767.

Prostrate slightly succulent herb, the young parts shortly hairy. Leaves large, petiolate, the lower 2—4 cm. diam., almost orbicular, the upper smaller, broadly ovate, obtuse: petioles about half as long as the blades. Flowers solitary, sessile or very shortly pedicellate. Perianth 4—6 mm. long, the tube longer than the acute lobes. Stamens about 10. Ovary truncate: style 1. Seeds compressed, rounded, with "ammonite-like" markings.

The type is *Hermann*. BM. SL. (of Jeffrey Kew Bull. 1960. 236.) A cosmopolitan weed of the tropics. Recorded from Portuguese East Africa at Inhaca Island but, so far, not further south.

Subgen. 2. **PAPULARIA** (Forsk.)

Jeffrey Kew Bull. 1960. 237.

Forsk. Fl. Aeg-Arab. 69. 1775. (pro gen.)

Flowers small, in clusters. Ovary 1- or incompletely 2-chambered: Ovules 2, superposed. Small plants. Leaves not over 0.5 cm. wide.

The type species is *T. crystallina* (Forsk.) Vahl, Sym. Bot. 1: 32. 1790.

KEY TO THE SPECIES

1. Perianth lobes at least as long as the tube .. .. .. 2. *salsoloides.*
1. Perianth lobes shorter than the tube
  2. Smooth: perianth lobes acute or acuminate .. .. 3. *parvifolia.*
  2. Hispid: perianth lobes obtuse or subobtuse .. .. 4. *triquetra.*

2. **T. salsoloides** Fenzl ex Oliv. Fl. Trop. Afr. 2: 588. 1871.

Prostrate. Leaves narrow, shortly petiolate, the sheaths with lateral projecting teeth. Flowers in clusters on the main stem and short lateral branches. Perianth less than 5 mm. long. campanulate, the lobes ascending, at least as long as the tube. Fruit more or less flat-topped the lid with a thickened circular ring.

The type is *Kotschy* 137 (Nubia) K.

A variable species of which three distinct varieties are recognisable within the area.

KEY TO THE VARIETIES

1. Stems hispid: leaves oblong-lanceolate: perianth lobes much longer than the tube .. ..
  2. Flowers 3 mm. long.: densely crowded: perianth lobes with a short mucro: leaves deciduous at flowering time .. *salsoloides.*
  2. Flowers 4—6 mm. long, in small groups: perianth lobes with a long mucro: leaves persistent .. .. .. *transvaalensis.*
1. Stems smooth: leaves linear: flowers 3 mm. long: perianth lobes with broad membranous margin .. .. .. *stenophylla.*

var. 1. **salsoloides**. Coarsely papulose, becoming hispid when older. Stems woody at the base. Leaves thick, rolled, those on the main shoots deciduous at flowering time: blades lanceolate, 1·5—2·5 cm. long, 0·2—0·3 cm. wide: petiole short. Flowers densely crowded, especially on short lateral branches, about 3 mm. long, densely hispid. Perianth lobes 2—3 times as long as the tube, with narrow brownish margins and a short mucro. Lid of the fruit with a prominent smooth thickened ring.

Throughout tropical Africa but not collected in the south.

var. 2. **transvaalensis** (Schinz) Adamson comb. nov.

T. transvaalensis Schinz Mitt. Bot. Mus. Zurich 60: 396. 1915 (pro sp.).

Diffuse or ascending. Stems up to 50 cm. high, the younger hispid-papulose, the older glabrescent: internodes 2—5 cm. long. Leaves linear-oblong, 1—2 cm. long, 2—3 mm. wide: petiole 3—4 mm. long: sheath with 2—3 teeth at each side. Flowers on very short lateral branches, in clusters of 3. Perianth 4—6 mm. long, the acuminate lobes twice as long as the tube, with a narrow margin, a long mucro and small obtuse projections between. Fruit as in var. *salsoloides*.

The type is *Schlechter* 4876 Z.

Apparently confined to the northern Transvaal, S. Rhodesia and adjacent territories.

TVL. Zoutpansberg. Madsaba *Schlechter* 4876; Dongola *Codd* 4862. Pietersburg. Magoeba's Kloof *Pott* 4785; Lydenburg. Groenlands *Barnard & Mogg* 1044; Pilgrims Rest. Leeuwpan *Acocks* 16749.

Var. 3. **stenophylla** Adamson var. nov.

A typo differt caulibus foliisque laevibus, foliis linearibus, floribus congestis in ramis floriferis brevissimis, lobis perigonii acutis late marginatis.

More slender than the other varieties with smooth stem and leaves. Leaves narrow, often rolled. Flowers crowded on very short lateral branches. Perianth lobes twice as long as the cup-like tube, acute, with rather broad membranous margins and small bulges between. Style with a broad 2-fid stigma.

The type is *v. d. Schijff & Marais* 3734 K. (isotype PRE)

Only recorded from the northern Transvaal.

Zoutpansberg. Soutpan *Meeuse* 10583; *Schweickerdt & Verdoorn* 459.

Kruger Nat. Pk. *v. d. Schijff & Marais* 3734.

3. **T. parvifolia** Sond. Fl. Cap. 2: 596. 1862.

T. triquetra Willd. subsp. *parvifolia* Jeffrey Kew Bull. 1960. 237.

T. crystallina auct. non Vahl (e.g. Sonder l.c.).

T. hereroensis Schinz Bull. Herb. Boiss. 5. App. 3: 76. 1897.

Prostrate, glabrous, shining, herbaceous or slightly woody at the base. Stem usually with unequal internodes. Leaves small, smooth, more or less succulent, petiolate: blades oblong to subrotund, obtuse. Flowers small, 1·5—2 mm. long, few or many, usually crowded. Perianth lobes acute, not longer than the obconical tube. Stamens 5. Style 1, with a bifid stigma. Fruit tapering to the base, the lid truncate-conical, with a thickened ring and thin depressed apex. Seeds 2, or solitary by abortion.

Dry regions through southern tropical Africa. In the Republic in the N.W. Cape and S.W. Africa.

Perennial but often behaving as an annual. A very variable species with several distinctive varieties. The descriptions and differentiation of these has been much confused by the misidentification of some of them as *T. crystallina* (Forsk.) Vahl. This commenced with Sonder (l.c.) and has been copied by all subsequent S. African workers. The true *T. crystallina* (Forsk.) Vahl is a plant found in N.E. Africa and S.W. Asia but not in central or southern Africa.

KEY TO THE VARIETIES

1. Inflorescence compact, umbellate.
    2. Inflorescence with 5—15 ascending flowers.
        3. Internodes unequal: perianth lobes much shorter than the tube: fruit lid with a narrow ring .. .. var. 1. *parvifolia.*
        3. Internodes equal: stems with distinct scars of leaves: perianth lobes about as long as the tube: lid of fruit with a broad thickened ring .. .. var. 3. *annulata.*
    2. Inflorescence many-flowered, spherical or hemispherical: lid of fruit with a small ring .. .. var. 2. *rubens.*

1. Inflorescence lax, with forking branches: lid of fruit with a broad ring .. .. var. 4. *corymbosa.*

Var. 1. **parvifolia.**

Stems up to 40 cm. long, with internodes 1—3 cm. long. Leaves with obtuse oblong or obovate blades, 3—12 mm. long, 2—3 mm. wide: petiole about as long as the blade: sheath broad. Inflorescence with 3—15 flowers, commonly about 10, the flowers sessile, contiguous, facing upwards. Bracts membranous, broad, obtuse or acuminate-apiculate. Perianth lobes triangular, membrane-edged, with a minute mucro behind the tip, about half as long as the smooth tube. Lid of the fruit truncate-conical, with a narrow thickened ring half way between the edge and the tip.

The type is *Drege* (Gamka Riv.) S.

Very variable in size and amount of branching. Flowers usually pinkish.

T. hereroensis Schinz. (type *Staph* Z.) seems to differ only in having larger leaves and flowers, and perianth lobes with an elongated mucro.

S.W. AFRICA: Keetmanshoop *Theron* 1993; Sandverhaar *Pearson* 4370; Waterberg *Bradfield* 188; Narudas Sud *Pearson* 8581; Gabis *Pearson* 4330; Maltahoe *Macdonald* 373.

CAPE: Namaqualand. Springbok *Zeyher* 633; Gt. Rozynbosch *Pearson* 3826; Prieska, Prieska *Bryant* 203, J203; Herbert. Douglas *Acocks* 1901; Prince Albert. Boterkraal *Bolus* 11516; Laingsburg, Gamka Riv. *Drege.*

Specimens, *Verdoorn* 1318, from Fauresmith O.F.S., probably belong here but differ in having many-flowered inflorescences.

Var. 2. **rubens** (Sond.) Adamson comb. nov.

T. crystallina var. *rubens* Sond. Fl. Cap. 2: 598. 1862.

Most often red. Stems rather woody, with internodes 0·7—3 cm. long. Leaves with oblong blades, about 5 mm. long and 2.5 mm. wide, longer than the petioles: sheaths toothed. Inflorescences on the main shoot and crowded on short lateral branches, many-flowered, spherical or hemi-spherical, shortly pedunculate, the flowers spreading all round. Perianth lobes with narrow membranous edges, about half as long as the tube. Lid of the fruit with a small thickened ring near the tip.

The type is *Drege* (Verleptpram) S.

The leaves often fall about the fruiting stage. Flowers dark red.

S.W.A. Okahandja *Dinter* 318.

CAPE. Namaqualand. Orange Riv. *Drege*: Iaus *Schlechter* 11420; Kenhardt. Kakamas *Wasserfall* 1041.

Also in Angola.

Var. 3. **annulata** Adamson var. nov.

A typo differt caulibus annulatis internodiis aequilongis, foliis granuloso-papulosis mox deciduis, floribus congestis, lobis perigonii tubo subaequilongis, operculo fructus late annulato.

A small succulent. Stems red, forking, marked by ring-like white scars 0·5—0·8 cm. apart: internodes equal. Leaves deciduous except on the youngest parts, finely granular-papulose: blades oblong to subrotund, 4—7 mm. long, 3—4 mm. wide, as long as the petioles. Flowers crowded. Perianth lobes with very narrow membranous edges and a short mucro, about as long as the tube. Lid of the fruit with a broad thickened band half to two-thirds the diam. and a small apical depression.

The type is *Pearson* 9231. K.

Stems woody at the base, the younger succulent, red, marked by distinct equidistant scars of the leaves.

S.W.A. Achterfontein *Pearson* 9231; Gt. Fish Riv. *Pearson* 9287.

CAPE. Kenhardt. Bladgrund. *Comins* 657.

Also in Angola.

Var. 4. **corymbosa** (Sond.) Adamson comb. nov.

T. crystallina var. *corymbosa* Sond. Fl. Cap. 2: 598. 1862.

Larger than the other varieties. Stems branched, with internodes up to 4·5 cm. long. Leaves less succulent, the blades oblong 5—13 mm. long, 3—4 mm. wide, slightly longer than the petioles: sheaths obtusely angled. Inflorescence rather lax, 5—15-flowered, with distinct forking pedicels. Bracts acuminate. Perianth lobes about as long as the tube, with very narrow membranous edges. Lid of the fruit thickened except for a small apical portion.

The type is *Drege* (*T. corymbosa* EM) S.

Possibly a separate species but the available material is scanty.

Orange River Valley. *Drege*; *Pearson* 5989.

Also in Angola.

4. **T. triquetra** Rottl. ex Willd. Ges. Nat. Fr. Neu. Sch. 4: 181. 1803.

T. sedifolia Vis. Pl. Aeg. Nub. 19. t.3 f.1 1836.

Like *T. parvifolia* but densely covered all over with prominent papillae becoming hard and hispid in the older stages. Stems ridged. Leaves larger with short petioles. Flowers with the perianth lobes half as long as the tube, the lobes obtuse or subobtuse.

Tropical Africa. Recorded from Bechuanaland and S. Rhodesia but not, so far, from S. Africa.

3. ZALEYA

Burm. f. Fl. Ind. 110. t.31. 1768.

Rocama Forsk. Fl. Aeg.-Arab. 71. 1775.

Large herbs with the habit of *Trianthema*. Flowers in groups. Ovary 2-chambered with 2 ovules in each chamber: styles 2. Fruit truncate, flat-topped, the lid thickened, more or less 2-lobed, with the lobes separating as 2 valves at dehiscence.

The type species is *Z. decandra* Burm.f.

1. **Z. pentandra** (L.) Jeffrey Kew Bull. 1960. 238.

Trianthema pentandra L. Mant. 1. 71. 1767 (cf. Melville Kew Bull. 1952. 211).

Rocama prostrata Forsk. Fl. Aeg. Arab. 71. 1775.

A many-stemmed prostrate or ascending rather coarse herb more or less woody at the base. Young parts covered with short rough hairs, the older glabrescent. Leaves opposite, usually unequal, petiolate, finely papulose: blades elliptical or oblong, usually obtuse, 1·5—3 cm. long, 0·7—1 cm. wide: petioles 0·4—0·8 cm. long, with a narrow entire sheath at the base. Flowers in crowded groups of 5—20, sessile or nearly so. Perianth 3—5 mm. long, the segments united for about half their length, the lobes parallel sided, subacute, shortly mucronate, with narrow membranous edges. Stamens 5. Ovary truncate, the top flat, with 2 obtuse bulges. Fruit about as long as the perianth, splitting about a third from the base along a smooth thickened rim, the flat-topped lid with 2 broad angles that separate as valves. Seeds 4, stout-reniform, sulcate.

The type is in herb. *Linn.* (572: 2).

Most common on rocks in dry river beds. Throughout tropical Africa, in S. Africa confined to the N.E. regions.

TVL. Zoutpansberg. Punda Maria *Codd* 6005; Soutpan *Schweickerdt & Verdoorn* 546; Potgietersrust. P.G.R. *Leendertz* 1885; Immerpan

Comins 911; Rustenburg. Swartruggens *Acocks* 19171; *Sutton* 946; Pretoria. Aapies Riv. *Schlechter* 3612: Rooiplaat *Leendertz* 776; Nelspruit. Komatipoort *Schlechter* 11793; Barberton. Avoca *Thorncroft* 2270.

SWAZILAND. Hlatikulu *Stewart*.

NATAL. Zululand. Mkuzi *Galpin* 13654.

CAPE. Kimberley. Boshof road. *Acocks* 1893 (? indigenous).

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KARYOTYPE ANALYSIS IN PROTEA L.

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(With Plate XI)

Studies of the karyotype have often been found useful if comparative relationships are to be made within and between species. One of the best examples of this is the genus Crepis. Morphological criteria of chromosomes are, *inter alia,* used by cyto-taxonomists for purposes of identification and establishing systematic relationships, since the karyotype has long since been recognized as a definite species character (Swanson, 1957).

Certain difficulties in the classification of South African *Protea* spp. suggest the use of chromosome studies as an aid to taxonomy. Up to now only de Vos (1943) has undertaken such studies. These studies led to a knowledge of the basic chromosome number and also established the existence of differences in the size of mitotic chromosomes and in the position of the centromere. But since then no attempt has been made to analyse the karyotype of *Protea* spp. in detail. This may be due to the belief that such an analysis, as expressed by Vogts (1960), is not considered a very profitable undertaking because of the chromosome size and possibly other factors.

In view of this situation, some attention was given as early as 1956 to the morphology of meiotic and mitotic chromosomes, during routine cytological investigations concerned with breeding research on Proteaceae. Pollen mother-cells were fixed in 1 : 3 acetic alcohol and stained in 0·25% acetocarmine containing 1·5% of a 10% $FeCl_3$ solution for 24 hours.

Root-tips of seedlings were pre-treated for 2 to 3 hours at 25°C in a saturated solution of monobromonaphthalene (O'Mara, 1948), fixed and stained in 1% propionic-carmine (Swaminathan, Magoon & Mehra, 1954) for 24 hours at room-temperature, treated with pectinase, as described by Pienaar (1955), and squashed.

The chromosome number of n = 12, as reported by de Vos (1943) was confirmed for the following additional species: *P. cedromontana*, *P. compacta*, *P. incompta*, *P. lacticolor*, *P. latifolia*, *P. longiflora*, *P. longifolia*, *P. minor*, *P. mundii*, *P. pulchella* and *P. rosacea*. The pairing of chromosomes in diakinesis was perfect in *P. arborea* and in *P. barbigera*, the mean number of chiasmata being $0 \cdot 84 \pm 0 \cdot 007$ per chromosome. In pachytene, a stage which is pre-eminently suitable for chromosome-morphological studies, all chromosomes were found to be partially hetero-chromatic and distinguishable morphologically. Though no detailed analysis of pachytene chromosomes was carried out it became clear that pachytene in Protea is no doubt suitable for studies of chromosome-morphology.

In mitosis, late prophase and early metaphase were found to be the stages most suitable for such studies. Fig. 1 gives a preliminary idiogram of *P. cedromontana*, prepared from camera lucida drawings of these stages, while Plate XI is a microphotograph of late prophase in *P. latifolia*. Primary and secondary constrictions can be distinguished without difficulty. The absolute length of the longest chromosome amounts to five microns while that of the shortest is 2·2 microns. There are two pairs of long chromosomes with subterminal centromeres, three pairs of short chromosomes with median centromeres, while the remaining pairs are of medium length with submedian or subterminal centromeres.

From these results it has become clear, that the chromosomes of Protea are neither too small nor in any other way unsuitable for a detailed morphological study and that they lend themselves very readily to simple cytological techniques.

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Plate XI

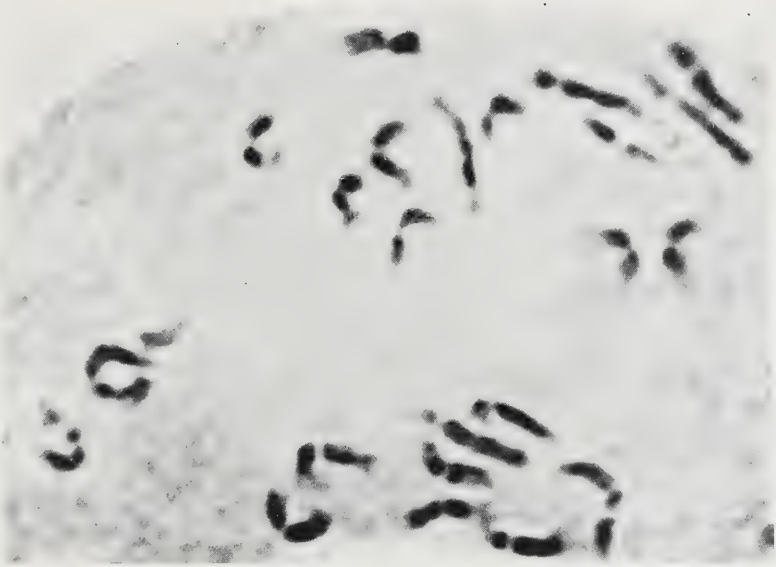

Fig. 1.—Photomicrograph of late prophase in *P. latifolia.*

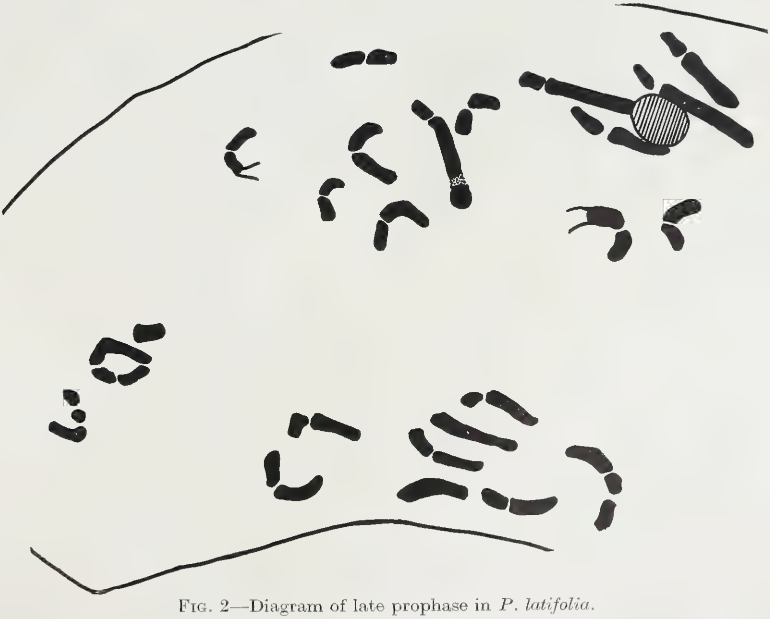

Fig. 2—Diagram of late prophase in *P. latifolia.*

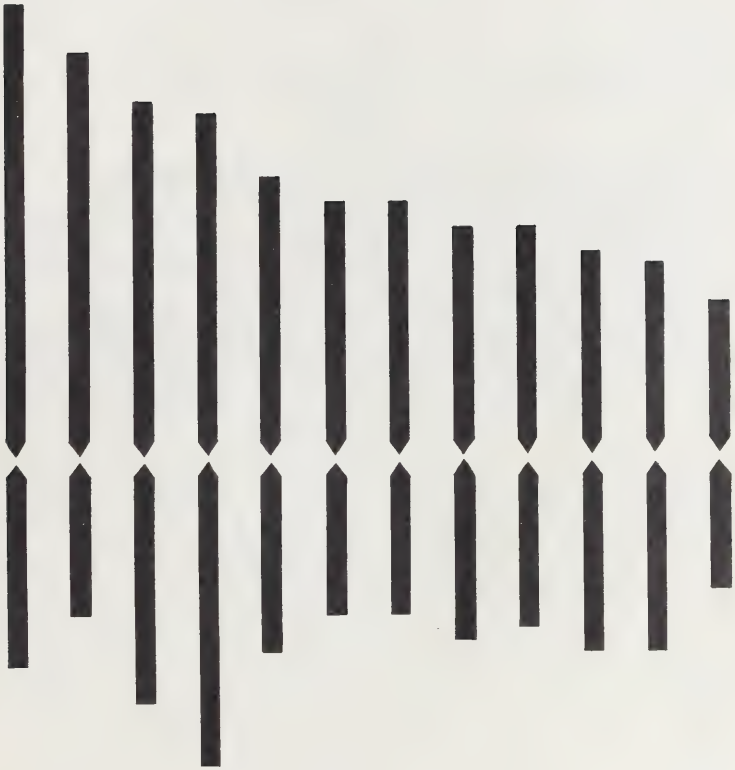

FIGURE 1.—Chromosome idiogram of *Protea cedromontana.*

BREEDING RESEARCH ON SOUTH AFRICAN PLANTS:
II. FERTILITY OF PROTEACEAE.

Met Opsomming in Afrikaans

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ABSTRACT

The seed set in open-pollinated flowers of Protea, Leucospermum and Serruria spp. was investigated and found to be low. Controlled self-pollinations revealed self-incompatibility in Protea and some Leucospermum spp. but self-compatibility in other Leucospermum spp. and *Serruria florida*. Investigation of the microsporogenesis and *in vitro* pollen germinations proved the viability of the male gamete. Carefully screened seed of Protea spp. germinated satisfactorily in unsterilized and sterilized soil as well as in vermiculite. Leucospermum and Serruria germination did not reach the high level of that in Protea. It is assumed that in all three genera good seed germination may be obtained merely by an effective method of sorting the sound from the unsound seeds. The results are discussed with regard to the possible presence of germination inhibitors, the possible role of microbes in germination, the natural mode of pollination in the genera mentioned and the importance thereof for future plant breeding work.

INTRODUCTION

From a recent survey on research work done on the family Proteaceae Juss. (Vogts, 1960), it becomes evident that no previous investigations have been made to clarify the mode of pollination in this family, or to explain the very low fruit set which is generally experienced in some South African genera such as Protea L. and Leucospermum R. Br. A more detailed knowledge of the natural and other possible modes of pollination, the generation turnover and the sexual propagation rate is however imperative for a breeding programme on Proteaceae, initiated at the above Institute in 1957.

PROCEDURE

The material used in this experiment was collected in the natural habitat or obtained from the National Botanic Gardens, Kirstenbosch, Cape, from commercial sources and also from plants grown at the experimental farm at Groot Drakenstein, Cape.

Plants chosen for the pollination experiments were isolated by the time of flowering or the flower heads were bagged with glassine bags.

Three sowing media were used: horticultural vermiculite, sterilized and unsterilized soil mixtures. Sterilization was effected by a temperature of at least 180°F for half an hour in an autoclave or a soil-sterilizer. The expression "seed" will be used instead of the botanically correct "fruit" in this paper. All the seeds from these experiments were carefully screened and only those being plump and able to resist some pressure were sown (= sorted seed). So-called unsorted seeds, mentioned later, were sown as received from the different sources after having been checked for mechanical damage, insect infestations, disease and immaturity. The seeds were sown during March and April.

Cytological investigation of pollen mother cells was carried out after fixing in 1 : 3 acetic alcohol and staining with 0·25% aceto-carmine containing 1·5% of a 10% $FeCl_3$ solution. *In vitro* pollen germination tests took place in a drop of water containing 50 ppm boric acid plus 25% sucrose for Leucospermum and 25% sucrose for Protea.

RESULTS

(1) *Germination of seeds*

Sorted Protea seeds from open-pollinated and non-isolated flowers germinated satisfactorily in all three media mentioned. With respect to vermiculite it was found that seed germinated equally well in the dark or under daylight conditions. The germination percentages as observed in sterilized soil are given in Table 1. In this table germination figures for each individual species, having approximately the same germination ability, were grouped in the following classes: (A) more than 66%; (B) between 66% and 33%; and (C) below 33% germination.

TABLE I: GERMINATION OF *PROTEA*

Tabel I: ONTKIEMING BY PROTEA

	Number of seeds sown *Aantal saad gesaai*		Mean Germination % *Gem. Ontkiemings %*	
	Sorted *Gesorteer*	Unsorted *Ongesorteerd*	Sorted *Gesorteer*	Unsorted *Ongesorteerd*
Group A[1] *Groep*	2,861	4,272	75·9 ± 7·7	11·2 ± 11·6
Group B[2] *Groep*	1,754	2,328	55·4 ± 5·3	10·3 ± 6·5
Group C[3] *Groep*	261	3,009	21·3 ± 5·8	8·5 ± 8·2

[1] Mean germination : $> 66\%$; includes: *P. compacta hybr., P. cynaroides, P. incompta, P. latifolia hybr., P. longiflora, P. longiflora hybr., P. neriifolia, P. neriifolia hybr., P. mundii.*
Gemiddelde ontkieming: sluit in:

[2] Mean germination : $> 33\% < 66\%$; includes: *P. barbigera, P. compacta, P. lacticolor, P. lanceolata, P. laurifolia, P. minor, P. pulchella, P. susannae.*
Gemiddelde ontkieming: sluit in:

[3] Mean germination : $< 33\%$; includes: *P. mellifera, P. longifolia.*
Gemiddelde ontkieming: sluit in:

Unsorted seed germinated unsatisfactorily. The difference between the mean germination percentage of sorted and unsorted seeds is significant in groups A and B. ($P = 0{\cdot}1\%$). The influence of the seed hairs on the germination shows a positive effect. Comparing the germination of seeds within the same species it was found that seeds with hairs gave 40·2% germination against 19·5% of the seeds with hairs rubbed off. This difference is significant ($P = 1\%$).

In Leucospermum and *Serruria florida* Knight only low germination was obtained, which, however, could be improved by a more effective seed-sorting procedure, as shown in Table 2. Some apparent discrepancies in the relation between the germination percentages of plump seed on the one hand

TABLE 2: GERMINATION OF LEUCOSPERMUM AND SERRURIA

Tabel 2: ONTKIEMING BY LEUCOSPERMUM EN SERRURIA

	No. of seed sown *Aantal saad gesaai*			Mean germination % *Gem. ontkiemings %*
	Plump *Dik*	Plump and light[1] *Dik en lig*[1]	Plump and heavy[1] *Dik en swaar*[1]	
L. attenuatum	905	—	—	12·5 ± 10·7
L. bolusii	2,184	—	—	22·6 ± 8·3
	—	201	—	29·8 ± 3·2
	—	—	156	49·3 ± 6·4
L. muirii	144	—	—	12·5 ± 10·6
L. nutans	1,092	—	—	33·4 ± 11·7
L. reflexum	2,276	—	—	9·3 ± 5·1
	—	308	—	1·6 ± 1·2
	—	—	247	7·3 ± 3·8
S. florida	2,476	—	—	14·4 ± 12·9
	—	152	—	2·6 ± 1·2
	—	—	330	15·1 ± 8·2

[1] Light seeds float on the surface of water whereas heavy seeds sink.
[1] *Ligte saad drywe op die oppervlakte van water terwyl swaar saad afsak.*

and plump and heavy or plump and light seed on the other hand may be explained by the fact that experimentation with seed weight took place in a different season.

(2) *Seed set in open-pollinated flowers*

Seed set was found to be very low even in flower-heads collected from populations in the natural habitat. The data are given in Table 3, on number of flowers per flower-head and the number of plump seeds per

TABLE 3: FERTILITY IN OPEN-POLLINATED FLOWERS IN PROTEACEAE

Tabel 3:
VRUGBAARHEID VAN VRY-BESTUIFDE BLOMME IN PROTEACEAE

	Number of heads used *Aantal hoofde gebruik*	Mean number *Gem. aantal*		
		Flowers/Head *Blomme/Hoof*	Plump Fruits/Head *Dik Vrugte/Hoof*	% Fruit *% Vrugte*
PROTEA				
barbigera	18	429·7 ± 144·0	12·0 ± 7·8	2·8
cedromontana	13	101·9 ± 22·9	—	—
compacta	33	89·7 ± 18·0	15·1 ± 9·8	16·8
compacta hybr.	20	294·6 ± 76·2	9·8 ± 4·3	3·3
incompta	37	289·1 ± 49·9	10·1 ± 10·6	3·5
lacticolor	21	94·3 ± 28·7	4·9 ± 4·2	5·2
lanceolata	12	56·9 ± 8·5	6·5 ± 2·2	11·4
latifolia	37	144·2 ± 21·0	34·8 ± 29·4	24·1
laurifolia	29	364·0 ± 56·1	4·8 ± 6·0	1·3
longiflora	16	—	3·6 ± 3·2	—
longiflora hybr.	70	169·9 ± 27·6	10·9 ± 12·7	6·4
longifolia	42	256·1 ± 83·9	1·8 ± 2·5	0·7
mellifera	45	78·2 ± 19·4	55·2 ± 16·3	70·3
minor	12	249·4 ± 154·9	4·3 ± 2·3	1·2
mundii	18	95·9 ± 28·6	3·3 ± 2·7	3·4
neriifolia	35	297·1 ± 63·9	10·7 ± 13·4	3·6
neriifolia hybr.	48	338·4 ± 105·2	19·0 ± 16·1	5·6
obtusifolia	57	283·7 ± 65·0	3·5 ± 3·1	1·2
pulchella	32	149·3 ± 58·2	14·5 ± 12·8	9·7
recondita	7	47·4 ± 12·1	—	—
scolymocephala	14	79·5 ± 45·7	3·4 ± 2·6	4·3
susannae	30	161·5 ± 22·7	10·0 ± 8·3	6·2
LEUCOSPERMUM				
attenuatum	271	108·6 ± 5·8	1·3 ± 0·4	1·2
bolusii	549	157·1 ± 7·5	3·8 ± 3·0	2·4
conocarpum	17	103·6 ± 7·1	4·9 ± 6·3	4·7
nutans	167	147·7 ± 8·1	3·2 ± 3·0	2·2
reflexum	422	161·1 ± 13·3	3·7 ± 3·7	2·3
SERRURIA				
florida	176	—	13·1 ± 4·4	—

flower-head. They show that in the majority of Protea spp. investigated the mean percentage of flowers which developed plump seeds is less than ten, one exception being *P. mellifera.* This impression is, however, erroneous, since the low germination in this species indicates errors in separating sound and plump from plump but unsound seed. In Leucospermum the seed set is equally low, while in *Serruria florida* it is higher than in the other genera.

Observations were also made with regard to the duration of the juvenile stage of a species, i.e. of the time elapsed until a plant first flowered. Most of the species mentioned started flowering in the third or fourth season after sowing.

(3) *Investigation of microsporogenesis*

No irregularities in the meiotic cycle were found in *P. arborea* and *P. barbigera.* Pairing in pachytene and diakinesis was perfect, the mean number of chiasmata being $\cdot 84 \pm 0\cdot 007$ per chromosome. *In vitro* pollen tests gave a maximum germination of 94% in Leucospermum spp. and 86% in Protea spp.

(4) *Controlled pollinations*

In this experiment 19 plants belonging to 12 different Protea spp. viz. *P. compacta* hybrid, *P. lacticolor, P. lanceolata, P. latifolia, P. laurifolia, P. longiflora* hybrid, *P. longifolia, P. mellifera, P. mundii, P. neriifolia, P. neriifolia* hybrid, *P. obtusifolia* and *P. susannae* were used. Almost 200 flower-heads with approximately 40,000 individual flowers were bagged and half of them were hand-selfpollinated. None of the mentioned species produced viable seed following mere isolation of the heads by glassine bags or isolation plus hand-selfpollination. Also not one of a few flower-heads isolated by their flowering time gave viable seed.

In Leucospermum 15 flower-heads of each of the species *L. attenuatum, L. bolusii, L. nutans* and *L. reflexum* were isolated by bags and one-third of which were self-pollinated. In *L. nutans* no plump seed was formed; in *L. bolusii* a mean of 0.4 plump seeds per flower-head were produced but these failed to germinate. In *L. attenuatum* and *L. reflexum*, however, flowers produced viable seed at a rate of 3·8 and 4·4 per head respectively. More than 300 flower-heads of *L. attenuatum* isolated by their time of flowering also set viable seed. From these seeds plants of normal vigour originated.

Flowers of 220 flower-heads of *Serruria florida* set seed freely when isolated by either of the above methods. Also in this case the seeds produced normal growing plants.

DISCUSSION AND CONCLUSIONS

Originally, the above experiments were initiated with the object of gaining knowledge which was of importance to the breeding project on Proteaceae. However, the results obtained have a bearing on published opinions as well as frequently accepted beliefs.

1. *Germination*

Some differences of opinion exist regarding the measures necessary for the germination of proteaceous seed.

Werner (1951, page 3) advises "that the seeds are no doubt encouraged to germinate by the even moist conditions." Vogts (1958) holds a similar opinion in stating that seedbeds should be kept damp, but not wet. The same author (Vogts, 1960, page 303), however, says later that seeds "will not germinate in good soil even if kept damp" and advises that the seeds "must be watered . . . in such a way that they are washed through and the inhibiting factor leached out." Furthermore Vogts (1960) found that seeds "will not germinate in sterilized sand" and "that soil microbes also play a part".

As a consequence of our own experiments and observations we are inclined to ascribe the main cause for the unsatisfactory germination in Proteaceae to ineffective means of separating fertile from infertile seed. The highly significant difference between sorted and unsorted seed with regard to germination cannot be explained otherwise. Also, the fact that in Leucospermum and Serruria, sound-looking but light seed germinated so much more poorly than heavy seed shows that the main task in improving the germination of proteaceous seed is to devise effective seed sorting methods. All the other aspects seem to be of secondary importance. The difficulty of this task is shown by our own observations, and also by those of Jordaan (1945 a, b, 1949) who in *P. mellifera*, also mentions the identical appearance of sound and unsound seeds. In Leucadendron he found that only 20 to 50% of sound-looking fruits were actually fertile.

Considering the influence of microbes on the germination of proteaceous seeds (Vogts, 1960) it is necessary to stress that in our experiments all seeds were successfully germinated in a steam-sterilized soil mixture and Protea seeds in pure vermiculite as well. This result does not favour the theory that soil-microbes play a decisive part in the germination of seeds of proteaceous genera. In exploded vermiculite, the microbial life is likely to be extremely poor while sterilized soil requires considerably more time to develop a microbial population than is needed for the germination of Protea seeds. Moreover, seed germinated well in both sterilized as well as unsterilized soil.

The question whether germination inhibitors play a role, keeping the seeds dormant if not sufficiently well diluted (Vogts, 1960) cannot be decided after the present observations. If such an inhibitor is assumed it can easily be inactivated or leached in most *Protea spp*, by merely keeping the seed-bed damp and giving it an occasional thorough soaking. Excessive watering is definitely not necessary. Since germination-inhibitors may be produced, destroyed or sensitized by light (Audus, 1953), it may also be mentioned that Protea seeds germinate under daylight conditions as well as in darkness. One can conclude therefore, that light is of no importance in the germination of these seeds. It also may be mentioned that a cold temperature treatment had no other than a retarding effect on germination. The situation is somewhat different, however, in the *Protea spp.* mentioned in group C in Table 1 and mainly in Leucospermum and Serruria (see Table 2). The germination period in these genera is usually longer than in Protea and the germination percentages obtained are lower than one would expect from sound seed. This fact could be explained by either of the following assumptions: that our seed-screening method was not as effective as in Protea and that therefore, many of the plump seeds were not actually fertile or that a germination inhibitor is present and that it is different from the one possibly present in Protea since it is not as easily washed out. Our opinion is that in all three genera good seed germination may be had merely by an effective way of sorting the sound from the unsound seed prior to sowing. In deciding this question further experimentation is required.

2. *Seed set*

As the present results show, seed set is relatively low both under natural conditions as well as under cultivation. A similar situation was reported previously by Jordaan (1945 a, b; 1949). He found that only 10—20% of the ovaries formed normal fruits in *P. mellifera*. He also reported that *Leucospermum conocarpum* sets up to 16% normal fruits while in *Leucadendron spp.* 0 to 80% fruit set was observed. One can assume that no true gametic sterility exists in the closely related members of the South African Proteaceae, since it has been demonstrated that the male gametes are completely viable. This is in agreement with De Vos (1943) who does not mention any meiotic irregularities during microsporogenesis in different genera of the Proteaceae. The development of the female gamete was investigated in Leucadendron and Leucospermum by Jordaan (1945 a, b) and no irregularities were reported. The cause of the low number of fertile seeds should therefore be sought in other directions, possibly in para-sterility (Brieger, 1930) or mechanical reasons such as deficiencies in the pollinator fauna.

3. *Mode of Pollination*

The question of pollinating agents is of importance when investigating the natural mode of pollination in Protea, Leucospermum and Serruria.

The pollinator fauna of the Proteaceae was investigated recently by Vogel (1954). He reviews the older literature on that subject which reported nectarinides as the main pollinating agents. This author, however, found that in Protea, Leucospermum and other genera of the family Proteaceae hymenopters also play a role. After studying the biology of the flowers he considers therefore the Proteaceae as ornithophilous as well as melittophilous and in rare cases as anemophilous. Considering nectarinides as well as hymenopters as pollinating agents is in agreement with our own observations and with those of several commercial growers of proteaceous plants. Vogts (1958) also mentions that *P. cynaroides* sets seed after pollination by bees. These pollinating agents as well as the protandry reported by Delpino (Knuth, 1909), Vogel (1954) and Vogts (1958) should ensure cross-pollination. Further proof that cross-pollination is the natural mode of pollination, at least in Protea and Serruria, lies in the great number of natural interspecific hybrids known. Hybrids are known, *inter alia*, of *P. barbigera*, *P. compacta*, *P. lacticolor*, *P. laurifolia*, *P. longiflora*, *P. mundii*., *P. neriifolia* and *P. susannae*.

It could nevertheless be demonstrated that *Serruria florida* and several *Leucospermum spp.* set seed after spontaneous and artificial self-pollination. This would mean that in disagreement with Delpino (l.c.) *Leucospermum spp.* are capable of self-pollination. Furthermore, it was demonstrated that they are self-fertile, that is, they produce a viable progeny after self-fertilization. Remarks in the literature (Vogts, 1958) indicate that there are self-fertile *Leucospermum spp.* other than those mentioned here, for instance *L. catherinae* and *L. album* which are described as fair to good seed producers under cultivation. *Serruria florida* is also self-fertile.

In the *Protea spp.* investigated, however, it was found that this genus is self-incompatible. No seed developed from isolated flowers nor from artificially self-pollinated ones, though in a few cases some plump seeds were found, which however, failed to germinate. Vogts (1958) mentions a good seed set in *P. barbigera* after artificial pollination without however stating whether following self or cross-pollination.

4. *Importance of results for future plant breeding work*

For the projected breeding programme on Proteaceae it is of practical importance that the self-incompatibility in Protea allows of cross-breeding without previous emasculation. But it also means that no breeding methods can be employed where any form of self-pollination is utilized. In the self-fertile *Leucospermum spp.* and *Serruria florida*, however, the development of improved, true breeding strains can be had by applying breeding techniques, usually employed for breeding of self-pollinated plants. This makes it possible to attain any breeding aim quicker than in cross-pollinated, self-incompatible plants. Cross-breeding, of course, is complicated by the necessity for emasculation which in the flower-heads of Proteaceae presents a formidable problem. Breeding of genera of the Proteaceae is of a long-term nature since the generation turnover is low due to the long juvenile stage of seedlings.

OPSOMMING

TEELNAVORSING BY SUID AFRIKAANSE PLANTE: II. VRUGBAARHEID VAN PROTEACEAE

Bestuiwingsproewe het getoon dat 12 *Protea spp.* en *Leucospermum nutans* self-onverenigbaar is; *L. reflexum*, *L. attenuatum* en *Serruria florida* is egter self-verenigbaar en self-vrugbaar. Waarnemings ten opsigte van aantal goeie saad per vry bestuifde blomhoof het getoon dat net 'n klein gedeelte van die blomme bevrug word. Hierdie groot persentasie onvrugbaarheid is egter nie deur gametiese steriliteit veroorsaak nie, want sitologiese ondersoek en *in vitro* stuifmeel-ontkiemingstoetse het geen abnormaliteit te voorskyn gebring nie.

Die groot persentasie dowwe saad is verantwoordelik vir die lae ontkiemingspersentasies, wat gewoonlik gevind word, want na sorgvuldige sortering van die saad kon 'n bevredigende ontkieming veral in Protea verkry word. Dit was die geval in ongesteriliseerde en gesteriliseerde grond sowel as in vermikuliet.

Die resultate word bespreek met betrekking tot ontkiemings-remstowwe, moontlike invloed van mikrobes op die ontkieming, die natuurlike bestuiwingswyse van die drie genoemde geslagte en toekomstige teelwerk.

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BREEDING RESEARCH ON SOUTH AFRICAN PLANTS:

III. INTRA- AND INTERSPECIFIC COMPATIBILITY IN *IXIA L., SPARAXIS KER., WATSONIA MILL. and ZANTEDESCHIA SPRENG.*

(Met Opsomming in Afrikaans)

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ABSTRACT

In connection with a breeding programme intra- and inter-specific fertility relationships were investigated in Ixia, Sparaxis, Watsonia and Zantedeschia. All genera and species observed are naturally cross-pollinated but capable of spontaneous self-pollination. In Ixia and Watsonia, however, inbreeding led to a decline in vigour. Interspecific and intersubgeneric crosses without a decrease in the fertility of the progeny were obtained relatively easily in all genera. These results are discussed in the light of their importance for plant-breeding as well as the relationships between breeding experiments and taxonomical units.

INTRODUCTION

Intra- and interspecific fertility-relationships were investigated during the initial stages of a breeding programme on Ixia, Sparaxis, Watsonia (all Iridaceae) as well as Zantedeschia (Araceae). This aspect of the breeding programme aimed at the development of new varieties for commercial floriculture was somewhat limited due to the fact that only those pollinations were made which were of some interest from a plant-breeding point of view. Nevertheless, this study includes experiments with and observations on more than forty species. It is, therefore, not only of importance for plant-breeding with respect to the above genera, but may also be of some interest to plant taxonomy.

PROCEDURE

Most of the plant material used was collected in the natural habitat in the South-Western Districts of the Cape, while some seeds and corms were obtained from commercial sources and also from the National Botanic Gardens Kirstenbosch. All experiments were carried out at the Bien Donné Experimental Farm at Groot Drakenstein, Cape.

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The following species were included: *Ixia conica* Salisb., *I. maculata* L., *I. odorata* Ker., *I. polystachya* L., *I. scariosa* Thunb., *I. speciosa* Andr., *I. viridiflora* Lam., *Sparaxis bulbifera* Ker., *S. grandiflora* Ker., *S. tricolor* Ker. *Watsonia ardernei* Sander, *W. beatricis* Mathews, *W. brevifolia* Ker., *W. bulbillifera* Mathews and L. Bolus, *W. galpinii* L. Bolus, *W. humilis* Mill, *W. marginata* Ker, *W. pillansii* L. Bolus, *W. pyramidata* Andr., *W. spectabilis* Schinz. *W. wordsworthiana* Mathews and fifteen other hybrids and unidentified spp., *Zantedeschia aethiopica* Spreng., *Z. albomaculata* Baill., *Z. macrocarpa* Engl. (= *Z. pentlandii* Whyte), *Z. melanoleuca* Hook., *Z. rehmannii* Engl. and one unidentified species with a yellow, blotched spathe and the cv. Helen O'Connor.

All artificial cross-pollinations and self-pollinations were carried out with the necessary precautions pertaining to emasculation and isolation. The latter was implemented either by covering whole plants with pollination cages or by enclosing the inflorescences in glassine bags. The following data were recorded during several seasons: Number of flowers pollinated, number of flowers which set seed, number of seeds harvested, number of seeds germinated, the vigour and the fertility of the progeny. The significance of the difference between two means was examined by means of a t-test.

RESULTS

(1) *Ixia*. A summary of the results is given in Table 1. They show clearly the superiority of cross-pollinations and the inferiority of the self-pollinations with regard to seed set. The seed set in all cross-pollinations is significantly better than that following self-pollination (P = 0·01 and 0·05 resp.). No differences exist between seed set in open pollinated flowers and that in artificially cross-pollinated ones.

TABLE 1

Summary of results of intra- and interspecific pollinations in *Ixia* and *Sparaxis*

Genus and mode of pollination	% flowers which set seed	No. of seeds per flower set	
		Mean	Mean maximum
Ixia			
open	66·9	12·0 ± 9·4	36·8
artif. intrasp. —x . .	77·8	15·7 ± 11·8	31·9
artif. intersp. —x . .	33·4	8·2 ± 7·2	23·7
spontaneous self . .	26·6	2·7 ± 5·7	21·3
artif. self	23·0	3·1 ± 4·0	15·7
Sparaxis			
open	82·7	10·7 ± 3·7	39·0
artif. intrasp. —x . .	91·6	14·9 ± 6·4	27·6
artif. intersp. —x . .	90·2	11·1 ± 11·3	31·3
spontaneous self . .	28·6	14·5 ± 9·3	29·5
artif. self	47·8	10·5 ± 5·2	21·0

Though all spp. investigated show the same tendency with regard to self-compatibility, it may be mentioned that there are indications that spontaneous self-pollination occurs more frequently in *I. polystachya* and *I. viridiflora*. *I. odorata* is apparently completely self-incompatible.

Germination ability was not affected by the mode of pollination nor was the fertility of the F_1 lost after inbreeding. There was, however, a clear inbreeding depression with regard to general vigour.

The crossability of the different spp., (Fig. 1) shows clearly that interspecific hybridization can be procured relatively easily in Ixia and that even crosses are possible between the subgenera Ixia proper and Morphixia.

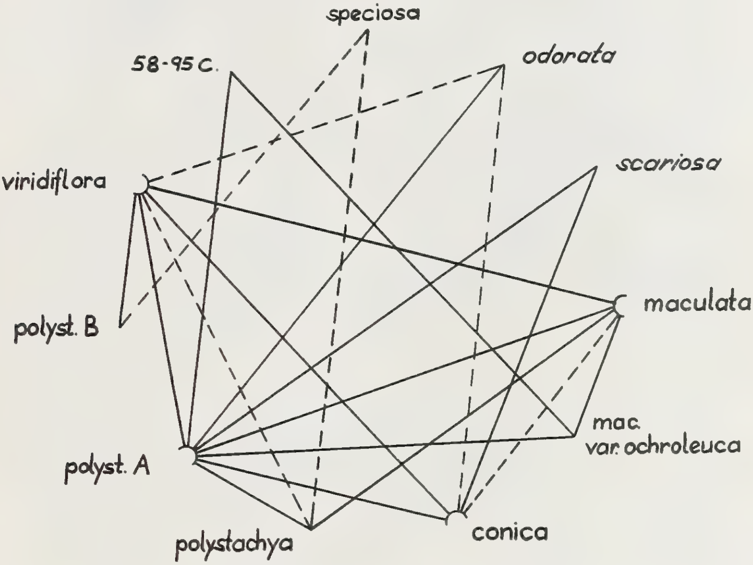

Fig. 1.—Diagram of interspecific crosses made in Ixia.
broken lines—unsuccessful crosses
solid lines—successful crosses
species italicized—Subgenus Morphixia
other species—Subgenus Eu-Ixia

(2) *Sparaxis*. A summary of the results is given in Table 1. As in Ixia the percentage of flowers which set seed after pollination is much lower following self-pollination than that after cross-pollination. But

no differences exist with regard to mean number of seeds per flower set. Similarly, fertility, germination ability and vigour of the F_1 is the same following self- as well as cross-pollination. All three spp. are cross-compatible with each other. There are, however, indications, that the fertility of such species-hybrids is reduced.

(3) *Watsonia*. A summary of the results is presented in Table 2. As can be seen from this, differences exist between the evergreen species and the deciduous species in that the evergreen species are relatively more self-compatible. In both groups the seed set following cross-pollination is superior to that after self-pollination ($P = 0{\cdot}01\%$). Interspecific crosses between the evergreen and the deciduous group were successful, as also crosses between species belonging to the two different subgenera Neuberia and Watsonia. The fertility of the F_1 developed from seeds from self-pollinated flowers was somewhat reduced and the general vigour showed a severe inbreeding effect.

TABLE 2

Summary of results of intra- and interspecific pollinations in *Watsonia*

Mode of pollination	% flowers which set seed	No. of seeds per flower set	
		Mean	Mean maximum
Deciduous spp.			
open	66·7	15·8 ± 7·7	34·8
artif. intrasp. —x	81·1	6·9 ± 4·9	12·4
artif. intersp. —x	85·3	13·9 ± 6·5	27·9
spontaneous self	7·8	6·1 ± 4·7	16·6
artif. self	16·7	3·9 ± 3·0	8·9
Evergreen spp.			
open	70·6	9·8 ± 2·9	12·5
artif. intrasp. —x	77·3	14·7 ± 5·9	18·8
artif. intersp. —x	89·6	15·7 ± 4·8	23·8
spontaneous self	86·0	7·5 ± 2·4	12·5
artif. self	87·9	9·6 ± 3·5	16·7
decid. x evergr.	46·2	6·1 ± 3·4	16·9

The cross-compatibility of the different spp. is given in Fig. 2. Of 128 artificial interspecific crosses only 21 proved incompatible, 71 of which had either *W. brevifolia* or *W. marginata* (both Subgenus Neuberia) as one parent, the remaining seven were crosses between evergreen and deciduous species. It may be mentioned that most crosses involving *W. brevifolia* succeeded if *W. brevifolia* was used as the pistillate parent. An explanation as to why seed set following intraspecific cross-pollination was low may be sought in the assumption that this kind of pollination was probably an intra-clonal one, that is, for all practical purposes a type of self-pollination.

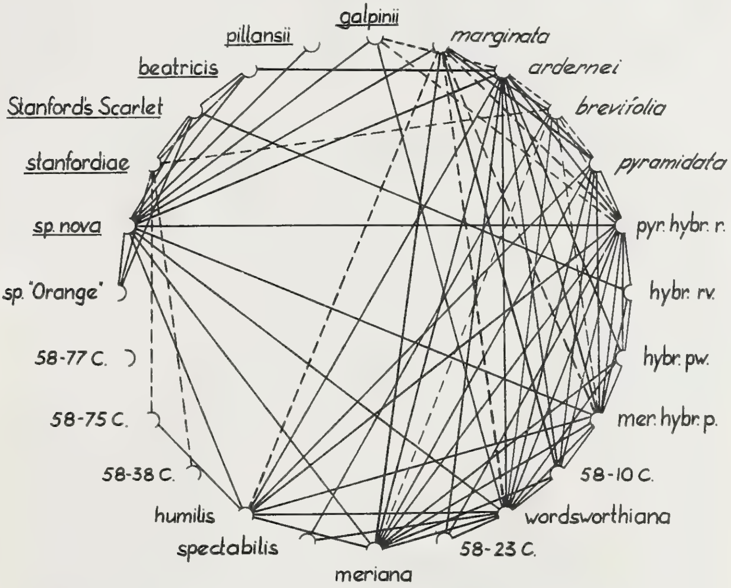

FIG. 2.—Diagram of interspecific crosses made in Watsonia.

broken lines—unsuccessful crosses
solid lines—successful crosses
species italicized—Subgenus Neuberia
other species—Subgenus Eu-Watsonia
species underlined—Evergreen spp.

(4) *Zantedeschia*. The only studies made were those involving the self-compatibility of species and those involving the crossability of species having a coloured spathe with *Z. aethiopica* as the male parent. A summary of the results with regard to seed set is given in Table 3. The percentage of flowers which set seed is an estimate based upon the mean number of flowers per inflorescence as observed over six seasons. With regard to seed set following open-pollination, all spp. tested reacted in the same way and this mode of pollination is superior to seed set following self-pollination and interspecific crosses. (P = 0·01 and 0·05.) The crossability with *Z. aethiopica* as a pollen parent is highest in

Z. rehmannii and practically nil in an unidentified species with a yellow spathe. The self-compatibility is, with the exception of the same unidentified species, surprisingly high. The vigour of the F_1-progenies is not seriously affected by interspecific crosses or inbreeding. Data pertaining to fertility are not yet available.

TABLE 3

Summary of results of intra- and interspecific pollinations in *Zantedeschia*

Species and mode of pollination	% flowers which set seed	No. of seeds per flower set	
		Mean	Mean maximum
Open, all spp.	80·4	2·5 ± 1·1	4·5
Artif. intersp. —x			
rehmanii	26·4	1·5 ± 0·4	2·7
melanoleuca macrocarpa	8·4		
"yellow"	2·4		
Spontaneous self			
macrocarpa	74·0	1·9 ± 0·7	3·3
melanoleuca	33·0		
rehmanii	40·2		
"yellow"	0		
cv. H. O'Connor	74·7		
Artif. self			
melanoleuca	82·6	1·9 ± 0·9	3·9
rehmanii	66·7		
cv. H. O'Connor	70·0		

It may be mentioned that the success of artificial interspecific pollinations varied considerably from year to year; it is not possible so far to offer an explanation for this.

DISCUSSION AND CONCLUSIONS

Intra- and interspecific fertility-relationships are of the utmost importance for breeding work on any subject, since the choice of a breeding technique and, therefore, the time required for a breeding programme, depend greatly on the breeding system, i.e. the mode of pollination, in the plant concerned.

Experimental evidence was brought forward that—

(1) Cross-pollination is the natural mode of pollination in the genera investigated,

(2) Spontaneous self-pollination is possible in all these genera,

(3) That interspecific crosses within the genera, even between different subgenera are not difficult to obtain,

(4) That inbreeding by selfing leads to a severe decline in vigour in Ixia and Watsonia, while Sparaxis and Zantedeschia suffer no ill effects. From these findings it can be concluded that in Ixia and Watsonia breeding techniques have to be applied as for cross-pollinated plants, capable of vegetative propagation, while in Sparaxis and Zantedeschia techniques can be also employed which are usually limited to self-pollinating plants and which lead to homozygosity in relatively short periods of time.

Crosses of *Z. aethiopica*, a winter-flowering species, with summer-flowering species possessing a coloured spathe have not been reported previously. The attempts to develop vigorous, multi-flowered varieties with coloured spathes is an old problem in horticulture. Thus far it has been tackled by crossing summer-flowering species with each other (Shibuya, 1956; Bailey, 1944). The products of such crosses, however, seem still to lack the flower production potential which makes the commercial production of *Z. aethiopica* so economical. A good opportunity for the development of new varieties which combine the qualities of summer- and winter-flowering species may exist in the production of hybrids between these two groups.

The self-compatibility of Zantedeschia as well as the lack of an inbreeding depression in inbred progenies as found in this study, was also observed by Shibuya (1956).

Crosses between *Watsonia* species of low height such as *W. brevifolia*, *W. humilis* and *W. spectabilis* with large-flowered species as *W. pyramidata* and *W. ardernei* and hybrids belonging to these species are considered of importance for the production of horticultural varieties of a suitable peduncle-length and a type of inflorescence which can be packed and transported easily. Several of the other interspecific crosses may serve in the production of a greater range of flower colours and types.

The success of interspecific crosses in *Ixia* may lead to a combination of a floriculturally superior raceme, as in *I. viridiflora*, with a range of flower colours obtainable in other species. In Sparaxis, long-stemmed forms of *S. bulbifera* may be useful in the production of suitable cut-flower varieties.

The results of this study may contribute further in answering the question to what extent cytogenetical investigation in general and breeding experiments in particular are able to aid plant taxonomy. The species-concept and the other taxonomical units are mainly built on morphological differences by which forms can be classified. Clausen, Keck and Hiesey (1939) proposed a new concept of taxonomical units based on breeding experiments in which crossability and fertility of the progeny play a prominent role. Furthermore, there is one school of geneticists who have attempted to erect reproductive isolation as the only or the most important criterion of a species. Gates (1951) reviewed and clarified the situation regarding this relationship between taxonomic units and cytogenetics. He quoted many genera or large subgenera of plants in which the species are nearly all infertile, and stated that mere divergence does not necessarily produce intersterility and that intersterility can arise in the absence of phenotypic differences.

The breeding experiments in Ixia, Sparaxis and Watsonia support this point of view. In these genera such morphologically different species as *Ixia scariosa* and *I. polystachya*, or *W. brevifolia* and *W. pyramidata* intercross easily and their progeny is fertile. Recently, in Viola a similar situation was reported (Horn, 1956). It would be absurd to lump all the inter-fertile forms into one morphologically divergent mammoth-species. On the other hand, intersterility can well stress existing morphological differences and so lead to the formation of a new species as was the case in another South African genus, namely Bulbinella Kunth (Horn, 1962), where the phenotypically different *B.* var. *latifolia* was put into one species with *B. robusta*, before breeding experiments had been carried out. Breeding experiments can, therefore, be of supplementary help in the circumscription of species as soon as morphological divergence is accompanied by reproductive isolation.

OPSOMMING

In verband met 'n teeltprogram is intra- en interspecies vrugbaarheidsverhoudings by Ixia, Sparaxis, Watsonia and Zantedeschia ondersoek. Al hierdie geslagte is natuurlik kruisbestuiwend, maar spontane selfbestuiwing is ook moontlik. Inteelt lei egter by Ixia en Watsonia tot 'n depressie van groeikrag. Geen groot moeilikheid is ondervind as interspecies en ook inter-subgenus-kruisings uitgevoer is, en die nageslag van sulke kruisings is vrugbaar. Die resultate van hierdie studie is bespreek met betrekking tot planteteelt en die verband wat tussen taksonomiese eenhede en bestuiwings-eksperimente bestaan.

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The author is indebted to Dr. R. I. Nel, Director of the W.P.F.R.I. for his support of this study; to Miss H. M. Bundies for invaluable assistance with the recording of the data and the pollination-work; to the Director, National Botanic Gardens, Kirstenbosch, for seed and corms kindly supplied, and to Mr. N. Hurter for reading the manuscript.

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AN ANNOTATED CHECK-LIST OF THE EPIPHYTIC ORCHIDS OF SOUTH AFRICA WITH KEYS TO THE GENERA AND SPECIES

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Taxonomic work done on this group since the publication of Rolfe's treatment of the Orchidaceae in the *Flora Capensis* (1912) has resulted in nomenclatural changes and in changes in the concepts of species and genera among the South African epiphytic orchids. Schlechter (1918), in a revision of the angraecoid orchids, proposed a new classification of this group, which, with modifications, has been accepted for some time by orchidologists, but which has been ignored by some botanists in South Africa. The more recent studies of African orchids by Summerhayes (1937—1960) have also led to changes in generic and specific concepts. A few new records for this region have resulted from recent field work and it is considered desirable that the present knowledge of the South African epiphytic orchids should be summarised and made known in advance of a monographic revision of these plants envisaged by the author when more material is available.

Names used in the *Flora Capensis* which are nomenclatural or taxonomic synonyms are given in italics and the numbers in brackets placed after specific epithets refer to the appended notes. The genera are grouped according to the second edition of Schlechter's *Die Orchideen* (1927).

The author wishes to express his gratitude to Mr. V. S. Summerhayes of the Herbarium, Kew, for valuable discussion, and to thank the Director of the Botanical Section of the Natürhistorisches Museum, Vienna for the loan of material from the Reichenbach Herbarium. Thanks are also due to various South African collectors who are providing live plants for this investigation.

Group **Polystachyinae**

ANSELLIA Lindl.
    gigantea Reichb. f. (1)
    gigantea Reichb. f. var. nilotica (Bak.) Summerh.

POLYSTACHYA Juss.
    imbricata Rolfe (2)
    transvaalensis Schltr. (3) (*P. natalensis* Rolfe)
    tessellata Lindl. (4)

tessellata Lindl. var. tricruris (Reichb. f.) Schelpe (*P. tricruris* Reichb. f.)
modesta Reichb. f. (5) (*P. rigidula* Reichb. f. & *P. similis* Reichb. f.)
ottoniana Reichb. f. (6) (*P. glaberrima* Schlecht.)
sandersonii Harv. (7)
pubescens Reichb. f.
sp. aff. fusiformis (Thouars) Lindl. (8)
gerrardii Harv.
zuluensis L.Bol. (9)

Group **Bulbophyllinae**

BULBOPHYLLUM Thouars
sandersonii Reichb. f. (10) (*Megaclinium sandersoni* [Reichb. f.] Oliv. & *M. scaberulum* Rolfe.)

Group **Sarcanthinae**

ACAMPE Lindl.
pachyglossa Reichb. f. (11)

DIAPHANANTHE Schltr.
xanthopollinium (Reichb. f.) Summerh. (12) (*Mystacidium gerrardii* Bol. & *M. peglerae* Bol.)

MICROCOELIA Lindl.
exilis Lindl. (13) (*Angraecum chiloschistae* Reichb. f.)

BOLUSIELLA Schltr.
maudae (Bol.) Schltr. (14) (*Angraecum maudae* Bol.)

AERANGIS Reichb. f.
mystacidii (Reichb. f.) Schltr. (15) (*Angraecum mystacidii* Reichb. f.)

RANGAERIS (Schltr.) Summerh.
muscicola (Reichb. f.) Summerh. (16)

MYSTACIDIUM Lindl.
millarii Bol.
caffrum (Bol.) Bol.
braybonae Summerh. (17)
capense (L.f.) Schltr. (18) (*M. filicorne* Lindl.)
venosum Harv. ex Rolfe.
gracile (Reichb. f.) Harv.
flanaganii (Bol.) Bol.
pusillum Harv.
aliciae Bol.

CYRTORCHIS Schltr.
arcuata (Lindl.) Schltr. (*Listrostachys arcuata* [Lindl.] Reichb. f.)
praetermissa Summerh. (19)

TRIDACTYLE Schltr.
bicaudata (Lindl.) Schltr. (*Angraecum bicaudatum* Lindl.)
tricuspis (Bol.) Schltr. (*Angraecum tricuspe* Bol.)
tridentata (Harv.) Schltr. (20) (*Angraecum tridentatum* Harv. & *A.bolusii* Rolfe.)

ANGRAECUM Bory
conchiferum Lindl.
cultriforme Summerh. (21)
sacciferum Lindl.
pusillum Lindl. (22) (*A. burchellii* Reichb. f.)

1. According to Summerhayes (1937b) the variety *nilotica* can be distinguished from typical *A. gigantea* by its larger and more heavily spotted (or barred) flowers and by the development of keels on the side lobes of the lip. Further study of this genus in Southern Africa is required.

2. *P. imbricata* subsp. *imbricata* has been discovered in the Letaba district of the Transvaal. (Illustrated in Schelpe [1961].)

3. *P. natalensis* Rolfe was apparently described from a small plant *P. transvaalensis*. *P. nigrescens* Rendle and *P. rendlei* Rolfe are also given as synonyms by Summerhayes (1956).

4. *P. tricruris* is considered to be conspecific with *P. tessellata* by Summerhayes (1942). However, two geographically-segregated variants are known to occur in South Africa. Yellow-flowered plants which occur as far south as the Nelspruit district of the Transvaal are referable to typical *P. tessellata* (see Fl. Pl. S.Afr.: pl. 846). In a more southerly area, from Zululand to Port St. Johns, the plants have lilac flowers tinged with brown and have a narrower lip (see Bolus, Ic. Orch. Austr. Afr., **2:** t.33). The type of *P. tricruris* was collected within this area, near the Tugela River, and was most probably a plant with brownish-lilac flowers. This southern segregate appears to be a distinct variety and the name *Polystachya tessellata* Lindl. var. *tricruris* (Reichb. f.) Schelpe comb. nov. is proposed for it. (*Polystachya tricruris* Reichb. f. in Flora, **50:** 118 [1867]).

5. Of the earliest names available for this species (*P. modesta* Reichb. f., *P. rigidula* Reichb. f. published simultaneously in Flora, **50:** 114, 117 [1867]) Summerhayes (1942) chose *P. modesta*.

6. *P. glaberrima* Schlecht. as well as *P. pisobulbon* Kraenzl. are most probably synonyms of *P. ottoniana.*

7. A plant from the Woodbush area of the eastern Transvaal illustrated under the name *P. sandersonii* in Fl. Pl. S.Afr., pl. 627, appears to be a new species allied to *P. zambesiaca* Rolfe.

8. This unusual species with superposed pseudobulbs has been collected in the Ngome Forest in Natal and in the Woodbush area of the eastern Transvaal. It is to be described as a new species by Summerhayes. (Illustrated in Schelpe [1961].)

9. *P. zuluensis* L. Bol. was described and illustrated in Fl. Pl. S.Afr.. **19:** pl. 727 (1939) from plants sent from the Lebombo Mountains where it grows on Vellozia stems.

10. The genus Megaclinium is not separable from Bulbophyllum. *M. scaberulum* Rolfe is only a form of *B. sandersonii* with squat pseudobulbs. *B. oreonastes* Reichb. f. with orange-brown flowers and a slightly dorsiventrally-compressed peduncle may be found in the eastern Transvaal.

11. The predominantly east tropical African *A. pachyglossa* is known from the Letaba district of the Transvaal and from near Stegi in Swaziland. It was illustrated in Fl. Pl. Afr.: pl. 1175.

12. *Mystacidium gerrardii* Bol. and *M. peglerae* Bol. were transferred to the genus Rhipidoglossum by Schlechter (1918). Summerhayes (1937a) found *M. gerrardii* to be conspecific with *R. xanthopollinium* (Reichb. f.) Schltr. Later Summerhayes (1960) transferred both species to Diaphananthe on the grounds that Rhipidoglossum and Diaphananthe could not be maintained as distinct genera. The author has re-examined the type-material of *M. peglerae* Bol. and finds that it is conspecific with *D. xanthopollinium.*

13. The African leafless angraecoid orchids, including Microcoelia, were revised by Summerhayes (1943).

14. Schlechter (1918) grouped the angraecoid orchids with iridiform leaves in Bolusiella.

15. *A. mystacidii* was illustrated by Bolus (Ic. Orch. Austr. Afr., **2:** t.2) under the name of *Angraecum saundersiae* Bol., which is a synonym.

16. *R. muscicola* was collected by Rudatis at Dumisa, Natal, and by the author at Port St. Johns and near Port Edward. Rangaeris was originally a subgenus of Aerangis in Schlechter's (1918) revision.

71. *M. braybonae* was described by Summerhayes (1949) from plants collected in the Zoutpansberg near Louis Trichardt.

18. *Epidendrum capense* L.f. (1781) antedates both *Limodorum longicorne* Thunb. and *Mystacidium filicorne* Lindl. (1836).

19. *C. praetermissa* Summerhayes (1949) is known from the lowveld of the eastern Transvaal and from Zululand as far south as the Ngoya Forest.

20. Summerhayes (1948) regards *T. tridentata* as a variable species of which *A. bolusii* is a synonym.

21. *A. cultriforme* Summerhayes (1958), a widespread east-African species, has been discovered near Mtubatuba in Zululand.

22. *A. burchellii* Reichb. f. is regarded by the author as only a large, moist-forest form of *A. pusillum.* Summerhayes (1958) retained them as separate species.

GENERIC KEY TO THE EPIPHYTIC ORCHIDS KNOWN TO OCCUR IN SOUTH AFRICA.

1. Plants with sympodial growth, i.e. with pseudobulbs on a rhizome and new growths arising from the base or middle of the pseudobulb formed in the previous year; inflorescences arising from the apices or bases of the pseudobulbs	2.
1. Plants with monopodial growth, i.e. without pseudobulbs and growth normally continuing at the apex of the stem; inflorescences arising in the axils of the leaves	4.
2. Inflorescence arising from the base of the pseudobulb which bears two leathery leaves at the apex	BULBOPHYLLUM
2. Inflorescence arising from the apex of the pseudobulb	3
3. Pseudobulbs cylindrical 30 cm. or more tall bearing a group of ribbed leaves more than 20 cm. long: dorsal sepal more than 2 cm. in length	ANSELLIA
3. Pseudobulbs cylindrical to pyriform less than 25 cm. long; dorsal sepal less than 2 cm. in length	POLYSTACHYA
4. Peduncle stout, 4–5 mm. in diam.; inflorescence usually shorter than the leaves, bearing fleshy yellow flowers with purple-brown markings	ACAMPE
4. Peduncle 3 mm. or less in diam.; flowers white, cream or pale green	5.
5. Plant leafless and with branched roots	MICROCOELIA
5. Plant with leaves or if leafless then with unbranched roots	6.
6. Leaves iridiform, laterally compressed	BOLUSIELLA
6. Leaves dorsiventral or terete	7.
7. Pollinia with separate stipes and separate viscidia	8.
7. Pollinia attached to a single viscidium	9.
8. Spur curved through a semi-circle; flowers pellucid; leaves spaced about 1 cm. apart	DIAPHANANTHE
8. Spur straight or slightly curved; flowers opaque; leaves closely set or leafless	MYSTACIDIUM
9. Distal half of lip trilobed	TRIDACTYLE
9. Distal half of lip not lobed	10.
10. Rostellum not elongate but deeply cleft	ANGRAECUM
10. Rostellum more or less elongated	11.
11. Lip similar in shape and size to the recurved petals; spur less than three times the length of the lip	CYRTORCHIS
11. Lip different in shape to the petals; spur more than four times the length of the lip	12.

12. Pollinia attached by separate stipes to a large common viscidium; lip broadly triangular .. RANGAERIS
12. Pollinia attached by a common stipe to a single viscidium; lip narrowly ovate AERANGIS

KEY TO THE SOUTH AFRICAN SPECIES OF *POLYSTACHYA.*

1. Pseudobulbs with a single leaf c. 15 cm. long and c. 2.5 cm. broad; flowers small, green, borne on a panicle .. .. *gerrardii*
1. Pseudobulbs with two or more leaves .. .. .. 2.
2. Pseudobulbs superposed, new growth arising from about the middle of the previous year's pseudobulb .. *sp.* aff. ***fusiformis***
2. Pseudobulbs not superposed, new growth arising from base of the previous year's pseudobulb .. .. 3.
3. Pseudobulbs cylindrical not swollen at their bases. 4.
3. Pseudobulbs swollen at their bases .. .. 5.
4. Flowers arising from between crowded, overlapping bracts; leaves acute, membraneous .. *imbricata*
4. Flowers subtended by distant bracts; leaves rounded, coriaceous, turning black on drying .. *transvaalensis*
5. Plants deciduous; flowers pale-lilac produced on inflorescences developed in the previous growing season .. .. *zuluensis*
5. Plants not deciduous; flowers lilac, yellow, greenish-brown or white developed on inflorescences developed during the current growing season .. .. 6.
6. Flowers 4–7 mm. across; inflorescence usually compound .. .. .. 7.
6. Flowers more than 8 mm. across; inflorescence simple .. .. .. 8.
7. Lip with a keel or ridge along the centre of the lip .. .. .. *tessellata*
7. Lip without a keel .. .. .. *modesta*
8. Lip pubescent to villous; flowers yellow with longitudinal brown markings on the lip and lateral sepals .. .. *pubescens*
8. Lip glabrous; flowers without longitudinal brown markings .. 9.
9. Apex of lip blunt, fleshy; lip with semiorbicular sidelobes and with a dome-like callus at the base of the front lobe .. *sandersonii*
9. Apex of lip membraneous, mucronate acute to acuminate; lip with oblong side-lobes and with a central keel extending from the base of the lip almost to the base of the front-lobe .. *ottoniana*

KEY TO THE SOUTH AFRICAN SPECIES OF *MYSTACIDIUM*

1. Plant leafless (or with one or two deciduous leaves up to 2 cm. long) with a mass of thin wiry roots, c. 1 mm. thick; spur c. 2.5 cm. long; flowering August—October .. .. *gracile*

1. Plant leafy with comparatively few roots; roots more than 1.5 mm. thick .. .. 2.
  2. Spur of the lip with a wide throat (i.e. inflated at the base); flowers crowded on short inflorescences .. .. 3.
  2. Spur of the lip with a narrow throat (i.e. not inflated at the base); flowers spaced along the inflorescence .. 5.
    3. Lip acute .. .. *braybonae*
    3. Lip rounded to emarginate .. .. .. 4.
      4. Leaves 9–11 cm. long; apex of spur not inflated; column white .. .. *millarii*
      4. Leaves 4–7 cm. long; apex of spur inflated; column emerald-green .. .. *caffrum*
        5. Flowers white; spur more than 2.5 cm. long 6.
        5. Flowers pale green or pale yellow; spur less than 2.5 cm. long .. .. ..
          6. Leaves 6—10 cm. long, 1.2 cm. broad; spur 4—5 cm. long; dorsal sepal linear-lanceolate, flowering October—January *capense*
          6. Leaves 2.5—5 cm. long, 0.6 cm. broad; spur 2.5—3 cm. long; dorsal sepal ovate; flowering May—July .. .. .. *venosum*
            7. Spur 0.7 cm. long; rostellum narrow *aliciae*
            7. Spur more than 1 cm. long; rostellum broad .. .. 8.
              8. Petals acuminate; rostellum smooth .. .. *flanaganii*
              8. Petals rounded; rostellum barbate *pusillum*

Key to the South African Species of *CYRTORCHIS*

1. Leaves flat; dorsal sepal 1.6—3 cm. long; spur 2.3—3.5 cm. long .. .. *arcuata*
1. Leaves strongly keeled; dorsal sepal c. 1 cm. long; spur c. 2 cm. long .. .. *praetermissa*

Key to the South African Species of *TRIDACTYLE.*

1. Leaves terete; lateral lobes of the distal portion of the lip acuminate .. .. *tridentata*
1. Leaves dorsiventral, keeled; lateral lobes of the lip truncate or fimbriate .. .. 2.
  2. Lateral lobes of the lip truncate, serrate .. .. *tricuspis*
  2. Lateral lobes of the lip fimbriate .. .. .. *bicaudata*

Key to the South African Species of *ANGRAECUM.*

1. Spur more than 1 cm. long .. .. 2.
1. Spur less than 0.5 cm. long .. .. 3.
  2. Spur inflated at apex, 1.8—2 cm. long; leaves falcate *cultriforme*
  2. Spur not inflated at apex, 3.5—5 cm. long; leaves linear .. .. *conchiferum*
    3. Flowers 1—4 per inflorescence, 6 mm. across; spur curved and inflated, as long as the lip; flowering December—February .. .. *sacciferum*
    3. Flowers 5—17 per inflorescence, 4 mm. across; spur straight, not inflated, half as long as the lip; flowering July—September .. .. .. *pusillum*

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A NEW ALOE FROM ARABIA

G. W. Reynolds

(With Plate XII)

Aloe gillilandii Reynolds. Species nova, affinis *A. sabaea* Schweinf., caule simplice, racemis brevioribus, segmentis liberis differt.

Caulis simplex, c. 2 m. alta. *Folia* c. 16, dense rosulata, basi 15 cm. lata, sensim attenuata, c. 65 cm. longa, patula usque recurvula; *supra* glauca, basi fere plana superne canaliculata; *subtus* convexa; marginibus dentibus deltoideis, cartilagineis 1—1·5 mm. longis, irregulariter 5—10 mm. distantibus munita.

Inflorescentia paniculata, ramosa, c. 90 cm. alta. *Pedunculus* basi plano-convexus et 18 mm. latus, sub medio c. 8-ramosus. *Bracteae* late ovato-acutae, 10 mm. longae, 8 mm. latae, scariosae, 5—7-nervatae. *Pedicelli* 12 mm. longi. *Perianthium* coccineum, late cylindrico-trigonum, 30 mm. longum, 10 mm. diametro; *segmenta exteriora* libera, 5—7 nervata. *Antherae* 3—4 mm. exsertae. *Stigma* demum 5 mm. exsertum. *Ovarium* viridulum, 6 mm. longum, 4 mm. diametro. (Plates)

Hab. Arabia, Hadhramaut, Dathina Plain, c. 130 miles N-E of Aden, *coll.* Prof. H. B. Gilliland, *fl.* Mbabane, Swaziland, 17 September 1961, Reynolds 6364 holotype (PRE), Iso (K).

Our new species is named after Professor H. B. Gilliland, (University of Malaya, Singapore) who first discovered plants in February 1952, on the Dathina Plain, about 130 miles north-east of Aden, Hadhramaut, Arabia, at an elevation of about 1,300 ft.

When sending a plant to me in 1952 Professor Gilliland remarked that plants were solitary, with simple stems up to 6—8 ft. in height. When this plant eventually flowered with me in September 1961, the description was completed.

In his book *In the High Yemen* (1942) the late Dr. Hugh Scott records (p. 41) "Aloes of unusual form, with tall pole-stems rising among dense thickets of the lower gorge of Wadi Dareija, . . . a few miles south-west of Dhala on the old track still used by camel caravans between Aden and Dhala" (Aden Protectorate, Arabia).

Scott identified it as being *A. sabaea* Schweinfurth, but this was incorrect. *A. sabaea* is a tree 25 ft. and more high, whereas *A. gillilandii* has a simple stem only 6—8 ft. tall.

Scott's photograph of these plants most strongly suggests that they are conspecific with *A. gillilandii*.

On p. 98, Scott mentions having seen "the same tall pole-stemmed Aloes" in the Saiyani District, northwards from Taizz on the road to Sana, in the Yemen. The present known distribution therefore, is from the Dathina Plain westwards through Dhala to near Taizz in the Yemen.

I have not seen the tree *A. sabaea* Schweinfurth in the Yemen, but judging from Berger's description in *Pflanzenr.* Liliac-Aloin. 320 (1908) it seems that *A. gillilandii* is a near ally in leaves, pedicels and flowers, but has a simple stem 1—2 m. high. *A. sabaea* is described *inter alia* as having a 3—4 branched inflorescence, 15 mm. long triangular-ovate bracts, and perianth outer segments connate into a tube for 6 mm. from base.

In *A. gillilandii* the inflorescence is 8-branched, the bracts are broadly ovate-acute, 10 mm. long and 8 mm. broad, while perianth outer segments are free to base.

DESCRIPTION

Plant with rather slender simple stem up to 2 m. or more.

Leaves about 16, densely rosulate, 15 cm. broad at base, gradually narrowing to an acute apex, about 65 cm. long, the youngest leaves spreading, the oldest recurved with their apices pointing downwards; *upper surface* unicoloured grey-green, almost flat at base, rather deeply canaliculate upwards; *lower surface* grey-green, rounded; *margins* with continuous pale-pink cartilaginous edge armed with rather soft pale-pink cartilaginous teeth 1—1·5 mm. long, irregularly 5—10 mm. apart.

Inflorescence a branched panicle c. 90 cm. high.

Peduncle basally plano-convex and 18 mm. broad, about 8-branched from below the middle, the lowest branch subtended at base by a broadly ovate-acute, many-nerved, brown, scarious bract 25 mm. long, 20 mm. broad.

Racemes cylindric-acuminate, c. 15 cm. long, 6 cm. broad, sublaxly-flowered, the buds suberect, open flowers cernuous to pendulous, the young buds at first hidden by large densely imbricate bracts.

Bracts broadly ovate-acute, basally clasping the pedicel, 10 mm. long, 8 mm. broad when pressed flat, brownish, scarious, 5—7-nerved.

Pedicels 12 mm. long, inserted in base of perianth almost at right angles.

Perianth scarlet, paler at mouth, broadly cylindric-trigonous, 30 mm. long, 10 mm. diam. across the ovary, rather thick and fleshy, the mouth upturned; *outer segments* free to base, paler at margins, 5—7-nerved, apices obtuse; *inner segments* free to base, with 3 crowded nerves forming a slight keel, apices brownish-tipped, obtuse to almost rounded and slightly revolute.

Filaments lemon, flattened, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 3—4 mm. *Stigma* at length exserted 5 mm.

Ovary green, 6 mm. long, 4 mm. diam.

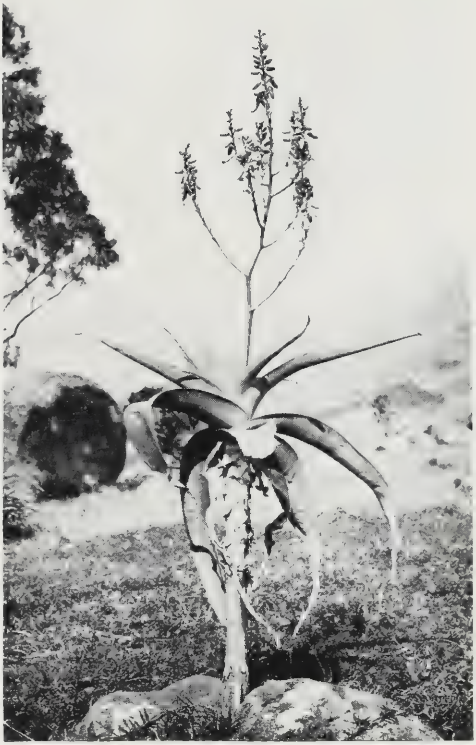

Fig. 1

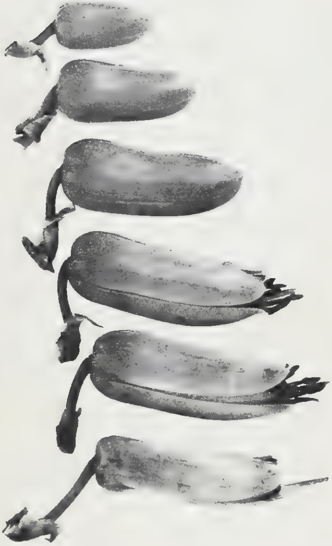

Fig. 2

Plate XII *Aloe gillilandii* Reynolds

Fig. 1.—Plant collected by Prof. H. B. Gilliland on the Dathina Plain, 130 miles N.E. of Aden, Hadhramaut, Arabia, flowering at Mbabane, Swaziland; height 6 ft.

Fig. 2. –Flowers natural size, from bud to post-pollination stage.

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NOTES ON MESEMBRYANTHEMUM AND ALLIED GENERA

H. M. L. Bolus

Oophytum nordenstamii L. Bol. sp. nov.—**O. oviformi** N. E. Br. affine, sed petalis latioribus niveis, filamentis intimis papillatis, lobis ovarii approximatis, obtuse compressis, differt.

Plantae ferae plures visae, caule ad 5 mm. diam., e 4—6 corpusculis compositae; corpuscula superne purpureo brunnea, florifera 1·7—2 cm. longa, medio ad 1·3 cm. lata diametroque, ore ad 9 mm. longo, minute ciliolato; folia superiora inferne membranacea, superne herbacea, ad 9 mm. longa cum vagina ad 4 mm., gemmis axillaribus interdum apicem fere attingentibus; pedunculus ebracteatus, 7—9 mm. longus; receptaculum globose obconicum, ad 4 mm. longum, 5 mm. diam.; calyx 6—7 mm. longus, tubo incluso, 2—3 mm. longo, segmentis exsertis obtusis, 4—5 mm., vel in flore altero 2—3 mm., longis, basi 1·5—3 mm. latis; petala ca. 4-seriata, exteriora e parum infra apicem inferne angustata, apice saepius rotundata, ad 1·8 cm. longa, ad 3 mm. lata, interiora pauca, linearia, 0·5—1 mm. lata; stamina ca. 5-seriata, nivea, filamentis ad 7 mm. longis, intimis parum supra basim papillatis; discus profunde divisus; ovarium ad 0·5 mm. elevatum; stigmata gracilia, superne attenuata, viridia, 3—4·5 mm. longa.

Cape Prov.: in dit. Vanrhynsdorp; Hol River, prope Koekenaap, Aug. 1962, *B. Nordenstam* 811.

One of the plants collected in the same locality a few days later consisted of 53 bodies, some fully developed and in flower, others in various stages of growth. The petals in this plant were up to 4 mm. broad. *Hall* 2494. N.B.G. 671/62. Mr. Hall found them "very numerous, associated with **Maughaniella.** Only one plant seen with *rose-pink* petals, otherwise all pure white."

Sphalmanthus humilis L. Bol. sp. nov.—Plantae pumilae glabrae; radix tuberosa, 1—2 cm. longa, 5—12 mm. diam., ramos breves, cum flore 3—5 cm. longos, emittens; partes herbaceae virides, inconspicue papillatae; folia alterna, fere erecta, supra visa plana vel interdum sulcata, lat. visa superne non, vel vix, angustata, apice dorsoque rotundata, 1—2 cm. longa, medio 4—6 mm. lata, 4—5 mm. diam.; flores 2·3—3 cm. diam., per diem noctemque expansi; pedunculi teretes ad 7 mm., vel in fructu immaturo ad 10 mm., longi; receptaculum clavatum vel subglobose clavatum vel in fructu immaturo globosum adque 1·3 cm. diam., 4—7 mm.

longum, 6—8 mm. diam.; calycis tubus ad 1 mm. longus, segmentis 5, variabilibus, nunc subaequalibus, 3—4 mm. longis, basi 3 mm. latis, nunc 5—9 mm. longis, basi 2—4 mm. latis; corollae tubus 1 mm. longus, segmentis densis, exterioribus ca. 4-seriatis, inferne leviter angustatis, obtusis vel subtruncatis emarginatisque, niveis, ad 1·4 cm. longis, 0·5—1·75 mm. latis, interioribus (staminodia?) densis, ca. 3-seriatis, acuta vel obtusa, aurea, ad 7 mm. longa, ad 0·5 mm. lata; staminodia gradatim in segmenta corollae transeuntia nulla; filamenta 8-seriata, aurantiaca, ad 3 mm. longa, antheris minutis, cum polline albidis; ovarii lobi stellate patentes, leviter compressi, dorso plani, ad 0·5—1 mm. elevati; stigmata 5 obtusa, 0·5—1 mm. longa; capsula non visa.

Cape Prov.: in dit. Vanrhynsdorp; Hol River, "about 8 miles from Koekenaap, Aug. 1962, *H. Hall* 2497. N.B.G. 674/62.

Sphalmanthus nanus L. Bol. sp. nov.—In habitu formaque foliorum ad **S. humilem** valde affinis, sed pedunculo, receptaculo et partim calyce capillaceo papillatis, segmentis corollae multo angustioribus, praecipue differt.

Tubera interdum reliquias annorum priorum ferentia, oblonga vel subglobosa, 2—2·5 cm. longa, ad 1·8 cm. diam., apice ramos 1—5, decumbentes floriferos, cum fructu immaturo, 3·5—7·5 cm. longos ferentia; partes herbaceae, purpureo brunneae, papillis primum subnitentibus; folia alterna, in ramo 3—7, ad 2·5 cm. longa; flores nocte claudentes, ad 3·3 cm. diam.; pedunculi teretes, 7—12 cm. longi, cum receptaculo, tubo calycis, et dimidio inferioris segmentorum molliter pubescentibus ob papillas capillaceas; receptaculum subglobosum, 4—5 mm. longum, 5—6 mm., vel in fructu immaturo ad 1·5 cm., diam.; calycis tubus ad 1·5 mm. longus, segmentis 5, 4—6 mm., vel in flore altero 5—9 mm. longis, vel in fructu immaturo ad 1·3 cm. accrescentibus, basi 3—5 mm., vel in flore altero 2—3 mm., latis; corollae tubus 1 mm. longus, segmentis ca. 3-seriatis, saepius obtusis, roseis, ad 1·3 cm. longis, 0·25—0.5 mm., vel rarius ad 0·75 mm., latis; staminodia acuta vel acuminata, quanquam tubo corollae adnata, antheras abortivas nullas ferentia, primum viridia, deinde inferne pallida, superne lutea, gradatim in segmenta corollae subtranseuntia; filamenta ca. 5-seriata, primum alba, demum aurea, antheris pollineque albidis; fossae nectariferae conspicue latae profundaeque; ovarii lobi stellate patentes, acute compressi, ad 0·75 mm. elevati; stigmata obtusa, 0·5—0·75 mm. longa.

Cape Prov.: Namaqualand; Komkans, "associated with **Jacobsenia hallii**"; Aug. 1962, *H. Hall* 2554. N.B.G. 731/62.

Aridaria littlewoodii L. Bol. sp. nov.—Erecta, "37 cm. alta, 92 cm. diam." (*Littlewood*); rami floriferi 3 visi; folia erecta, fere teretia, supra subplana vel convexa, interdum subfalcata, matura 3—25 mm. longa, 4—5 mm. lata diametroque; cymae utrinque ad 5—6-ramosae, ramis ascendentibus vel patentibus, interdum superne sursum curvatis subintricatisque, ad 12 cm. longae, ad 18 cm., vel fructiferae ad 25 cm., diam.; pedunculi ultimi, supra bracteas mensi, saepius 1—2·5 cm. longi; bracteae ultimae interdum subglobosae; flores per noctem expansi, ad 4·2 cm. diam.; receptaculum verum obconicum, ad 7 mm. longum, vel de pedunculo per 6—7 mm. decurrens quasi subpiriforme, ad 1·4 cm. longum, apice 7—8 mm. diam.; calyx in alabastris maturis ad 1·3 cm. longus, in floribus maturis 1—1·2 cm. longus cum tubo ad 3·5 mm. longo, apice constricto, segmentis inaequilongis, in alabastris omnibus subteretibus, obtusis vel interdum interioribus acutis, ad 4 mm. diam., 6—11 mm., in floribus 6—8 mm., longis, basi 3—6 mm. latis; corolla ad 2·2 cm. longa, cum tubo 2—3 mm. longo, segmentis ca. 4-seriatis, albis obtusis, extimis dorso roseis, 0·25—1 mm. latis; staminodia nulla; stamina ca. 9-seriata, suprema dimidum segmentorum attingentia, filamentis albis, antheris pollineque albidis; ovarium e nectario conice ad 1 mm. elevatum, lobis superne acute compressis, dorso concavis; stigmata basi vix patentia, gracillima, apice tantum leviter angustata, papillis inconspicuis, ad 6 mm. longa; capsula infra obconica, 4—5 mm. longa, ad 7 mm., expansa ad 1·7 cm., diam., supra ad 6 mm. elevata; semina conspicue cristata, brunnea, 1·5 mm. diam.

South-West Africa: "17 miles W. of Grunau", Maio 1961, *R. C. Littlewood*. Karoo Garden 369/61. Fl. 9.2.1962.

Lampranthus pleniflorus L. Bol. sp. nov.—Rami plures visi, lignosi rigidique, glabri politi brunnei, ad 35 cm. longi, per totam longitudinem, eodem tempore, ramulos floriferos emittentes, itaque pleni florum, internodiis 1·5—4·5 cm. longi, 2—3 mm. diam.; folia adulta ascendentia vel patentia, supra plana, e medio superne angustata, acuta vel obtusa, dorso rotundata, lat. visa obtusa, apice saepe obscure uncinata, saepius 1—2 cm. longa cum vagina ad 1 mm., medio 2—3 mm. lata, 3—5 mm. diam.; inflorescentia ad 8 cm. diam., floribus in cymulis ultimis demum 2-ternatis, pedunculis teretibus gracilibus, saepe rubicundis, ultimis 5—10 mm. longis, lateralibus prope medium bracteatis, bracteis ad 6 mm. longis; receptaculum obconicum, medio leviter constrictum, ad 2 mm. longum, 3—4 mm. diam.; sepala 5, acuta subaequilonga, saepius 3—3·5 mm. longa, basi 2—2·5 mm. lata; petala 2-seriata, inferne superneque leviter angustata, acuta vel obtusa, purpureo rosea, marginibus saturatioribus, 4—5 mm. longa, 0·5—1 mm. lata; staminodia staminibus arte appressa eaque aequantia vel excedentia, valde incurvata constrictaque, deinde erecta, inferne pallida vel alba, obscure ciliate papillata, superne rosea; filamenta ca. 4-seriata, superne purpureo rosea, ad 2 mm. longa, intima prope medium papillata, antheris pollineque rubre aurantiacis; discus profunde denticulatus; ovarii lobi dorso complanati vel leviter convexi, ad 0·75 mm. elevati; stigmata anguste subulata, ad 2 mm. longa cum cauda 0·5 mm.; capsula infra obconica, 5-angulata, angulis rotundatis, 3 mm. longa, supra per 2 mm. elevata, suturis vix compressis, ad 6 mm., expansa ad 1 cm., diam., carinis superne divergentibus, medium valvae attingentibus, breviter aristatis, alis amplis, apicem valvae leviter superantibus; semina subobovata levia brunnea, 1 mm. longa vel parum ultra.

Cape Prov.: in dit. Worcester; De Doorns, Jun.—Jul. 1962, *P. A. B. van Breda* 1710/62.

Lampranthus ebracteatus L. Bol. sp. nov.—Erectus, "ca. 25 cm. altus"; rami culti visi ad 5 mm. diam., internodiis 5—20 mm. longis; folia adulta saepius sublunata, supra visa linearia acuta, lat. visa inferne leviter angustata, apice rotundata apiculoque medio posito, vel subacuta, lateribus leviter convexis, carina subacuta, 1—2 cm. longa, medio 3—6 mm. lata, 5—7 mm. diam.; flores 3-nati vel 2-ternati (floribus 3—9) vel irregulariter 3-ternati (in infructescentia capsulis 14); pedunculi ebracteati, in receptaculum transeuntes, 5—10 mm. longi; receptaculum clavatum 2-carinatum, 5—6 mm. longum diametroque: sepala 5, subacuta, 5—7 mm. longa, basi ad 3 mm. lata, exteriora compressa, ad 1·5 mm. diam.; petala 2-seriata, e medio vel infra inferne angustata, apice rotundata, pallide rosea, 7—10 mm. longa, fere ad 2 mm. lata; staminodia acuta vel acuminata, ad medium vel ultra dense intertexteque ciliate papillata, inferne alba, prope apicem rosea, primum stamina excedentia, mox delapsa; filamenta 3—4-seriata, conice conferta, interiora medio vel supra papillata, antheris pollineque pallide lutea; glandulae disci approximatae vel 2 interdum contiguae; ovarii lobi dorso plani, apice rotundata, ad 1 mm. elevata; stigmata 5, subulata, 2—4 mm. longa.

Cape Prov.: in dit Vanrhynsdorp; Papendorp, "at the mouth of the Oliphant's River", *H. Hall.* N.B.G. 613/57. Fl. Nov. 1961.

Lampranthus holensis L. Bol. sp. nov.—Rami 3 feri visi, cum flore ad 20 cm. longa, 5—6 mm. diam., internodiis 1—3 cm. longis; ramuli hornotini saepius crebre 4-foliati, internodiis ad 5 mm. longis vel in partibus umbratis longioribus; partes herbaceae levissimae, pallide glauce virides; folia adulta ascendentia vel demum patentia, supra visa convexa acuta, lat. visa prope basim apicemque leviter angustata, acuta, dorso rotundata, 4·5—5·5 cm. longa cum vagina ad 2 mm., medio 4—5 mm. lata diametroque; ramuli floriferi cum flore 6—10 cm. longi; flores solitarii meridiani, post expandentes per dies plures ad 6 cm. diam.; pedunculi 2—4 cm. longi, prope medium bracteati, bracteis interdum basi concavis dilatatisque, 1—1·6 cm. longis, ad 5 mm. diam.; receptaculum clavatum, ca. 6—8 mm. longum, apice 6—8 mm. diam.; sepala 5 vel rarius 6, ca. e medio superne angustata, subobtusa vel acuta, interiora 2 apice longe subulata, omnia ± marginata, 1—1·5 cm. longa, basi 3—7 mm., vel in flore altero 4—8 mm., lata; petala ca. 4—5-seriata, nivea, inferne leviter angustata, obtusa, ad 2·6 cm. longa, ad 2 mm. lata, interiora pauca, ad 0·5 mm. lata; staminodia nulla; filamenta ca. 4—5-seriata, rubre purpurea, ad 6 mm. longa, interiora basi papillatis, antheris pollineque aureis; ovarii lobi erecti approximati, obtuse compressi, ad 1 mm. elevati; stigmata 5, subulata, ad 3 mm. longa cum cauda 1 mm.; capsula atrata, infra clavata, ad 9 mm. longa, ad 1 cm., expansa 2 cm., diam., supra ad 3 mm. elevata, suturis leviter compressis.

Cape Prov.: in dit. Vanrhynsdorp; Hol River, prope Koekenaap, Aug. 1962, *H. Hall* 2568. N.B.G. 745/62.

FORMA.—A forma typica petalis angustioribus, filamentis albis, alis valvarum capsulae angustioribus, differt. Eodem loco temporeque, *H. Hall* 2506. N.B.G. 683/62.

Drosanthemum littlewoodii L. Bol. sp. nov. (*Hispicaulia*).—"Planta 9 cm. alta, 34 cm. diam., caule basi 6 mm. diam.; ramuli floriferi erecti 1—2-fl., 1 cm. longi" (*Littlewood*). Rami plures visi, decumbentes graciles, brevissime hispidi, ad 16 cm. longi, ad 1·5 mm. diam., internodiis 1—2 cm. longis; folia saepe basi patentia, deinde fere erecta vel subincurvata, supra visa inferne concava, obtusa, lat. visa inferne leviter angustata, apice rotundata, lateribus convexis, dorso rotundata, papillis crebris minutis, vix nitentibus, 1—1·2 cm. longa cum vagina ad 2 mm., ad 3 mm. lata, 3—4 mm. diam.; pedunculi ad 8 mm. longi; receptaculum obconicum, minute papillosum, 3—4 mm. longum, ad 5 mm. diam.; sepala 5, in alabastro 4—5 mm. longa, in flore maturo mox submarcescentia, basi 2—3 mm. lata; petala 3-seriata, anguste spathulata, apice interdum subtruncata inconspicueque emarginata, albida nitentia, ad 1 cm. longa, 1·5 mm., vel rarius ad 2 mm., lata; staminodia nulla vel subnulla; filamenta ca. 4-seriata, diu erecta, alba, ad 5 mm. longa, interiora parum supra basim papillata, antheris pollineque dilute luteis; glandulae humillimes subdistantes; ovarium circa marginem planum, lobis distantibus, obtuse compressis, demum fere ad 0·75 mm. elevatis; stigmata 5, gracilia viridia, 4 mm. longa.

South-West Africa: Namies Kloof, Oct. 1961, *R. C. Littlewood.* Karoo Garden 735/61. Fl. Jul.—Aug. 1962.

Ruschia vanbredai L. Bol. sp. nov.—Planta "12 cm. alta, 35 cm. diam." (*van Breda*), inter gracillimas in genere, copiose diffuse ramosi; rami primarii plures visi, 14—17 cm. longi, internodiis 2·5—3·5 cm. longis, ad 2 mm. diam.; ramuli ad 15 cm. longi, 1—1·5 mm. diam., juniores rubre brunnei; partes herbaceae saturate virides; folia adulta ascendentia vel mox patentia, saepe falcata vel subfalcata, supra plana linearia acuta, lat. visa saepius e prope basim superne ampliata, apice ± rotundata, lateribus convexis, 1—1·7 cm. longa cum vagina vix ad 1 mm., medio 3—4 mm. lata, 4—6 mm. diam., in ramulis minora; flores 3-nati vel fortasse demum irregulariter 2-ternati; pedunculi teretes, in receptaculum gradatim transeuntes, 4 mm., vel culti ad 8 mm., longi, laterales prope basim bracteati, bracteis interdum subglobosis, 2—4 mm. longis; receptaculum subclavatum, 3 mm. longum diametroque; sepala 5, e basi gradatim angustata acuta, 3—3·5 mm. longa, basi vix ad 2 mm. lata, interiora marginata; petala 3-seriata, interiora pauca, e medio inferne angustata, obtusa, purpureo rosea, inferne conspicue, superne inconspicue, vittata, 3—5 mm., vel in flore altero ad 8 mm., longa, 0·5—1·25 mm. lata; staminodia perpauca, ad stamina conice conferta appressa eaque aequantia, cum filamentis inferne pallide, superne saturate, purpureo rosea; filamenta 4-seriata, ad 3 mm. longa, intima prope medium papillata, antheris pollineque albis; discus crebre crenulatus; ovarii lobi fere erecti, approximati, obtuse compressi, ca. ad 0·5 mm. elevati; stigmata 5, anguste subulata, demum ad 2·5 mm. longa cum cauda 0·5 mm.; capsula infra obconica, 1·5—2 mm. longa, vix ad 5 mm. diam., supra ad 2 mm. elevata, suturis valde compressis, valvis expandentibus erectis, marginibus valde reflexis, carinis e basi divergentibus, medium valvae vix attingentibus, muticis, tuberculo alas tegentes attingente, partem tertiam oris tantum complente, supra visa anguste oblongo, pallide brunneo; semina ovalia vel subobovata, levissima minuta.

Cape Prov.: in dit. Uniondale; "on the farm Sapreerivier (about 20 m. from Uniondale), Bou-Kouga, Langkloof", *P. A. B. van Breda* 1688. Fl. Jun. 1962.

Ruschia ebracteata L. Bol. sp. nov.—Planta 1 visa, erecta rigida, 8 cm. alta, caule basi 9 mm. diam.; rami primarii ad 18 cm. longi, 2—6 mm. diam., internodiis 5—15 mm. longis; ramuli ultimi primum crebre 4—8-foliati, demum floriferi 2·5 cm. longi, internodiis 2—5 mm. longis; partes herbaceae tactu subvelutinae ob papillas minutas (sublente 15 × visas), subglauce virides, ferae interdum rubre suffusae, minute punctatae, punctis saturate viridibus; folia mox patentia, supra plana obtusa, lat. visa saepius superne ampliata, apice rotundata, apiculo obscuro, medio posito, dorso rotundata, carina invisa, lateribus convexis, 7—9 mm. longa cum vagina 1 mm., medio 3—4 mm. lata, superne ad 5 mm. diam.; flores 3-nati, alabastris acutis; pedunculi ebracteati, graciles, demum 2—4 mm. longi; receptaculum subcyathiforme, apice leviter constrictum, ad 3 mm. longum, 3—4 mm. diam.; sepala 5 (vel 6 in flore unico visa), acuta, omnia ± marginata, 3—4 mm. longa, basi 1·5—1·75 mm. lata; petala 2-seriata, subspathulata, pallide rosea, inconspicue vittata, ad 6 mm. longa, 0·5—1 mm. lata; staminodia non bene visa, demum valde recurvata; filamenta ca. 3—4-seriata, alba vel in siccis superne rubida, ad 3 mm. longa, exteriora inferne ciliate papillata, interiora parum supra medium dense papillata; discus crenulatus; ovarii lobi ad discum stellate patentes, obtuse compressi, ad 0·75 mm. elevati; stigmata 5, gracillima, ad 4 mm. longa; capsula non visa.

Cape Prov.: Namaqualand; Richtersveld, Rooiberg, Jan. 1961, *A. J. Middlemost.* N.B.G. 427/61. Fl. Mart. et Jul. 1962.

Ruschia middlemostii L. Bol. sp. nov.—Planta 1 visa, fera erecta robusta, 33 cm. alta, apice 25 cm. diam., caule basi 1 cm. diam.; rami primarii ad 29 cm. longi, ad 8 mm. diam., internodiis 1·5—2·5 cm. longis; ramuli hornotini floriferi saepius 2-foliati, gemmis axillaribus bene evolutis, steriles crebre 4—6-foliate; partes herbaceae velutinae ob pilos minutos, vel cum aetatate glabrescentes sed tamen subvelutinae; folia variabilia, demum late patentia, senectissima adulta fera crassissima, saepius 1—1·5 cm. longa, 7—10 mm. lata ad 10 mm. diam., supra visa apice rotundata vel acuta, lat. visa apice ± rotundata, lateribus convexis, carina obscura, juniora culta, praecipue in partibus umbratis, saepe subcompressa, lateribus leviter convexis, carina subacuta vel ad lineam reducta, supra visa acuta, ad 3·3 cm. longa, 3—4 mm. lata, 4—5 mm. diam., vel rarius lat. visa inferne leviter angustata, ad 3 cm. longa, medio 7 mm. lata, 9 mm. diam.; pedunculi in receptaculum gradatim transeuntes, 1·7—2 cm. longi, prope medium bracteati, bracteis erectis sed non amplectentibus, 5—9 mm. longis; receptaculum clavatum, parum supra medium leviter constrictum, 4—5 mm. longum diametroque; sepala 6, obtusa vel acuta, omnia ± marginata, ad 4—5 mm. longa, basi 2—3 mm. lata; petala ca. 3-seriata, exteriora parum inaequilonga, inferne non, vel vix, angustata, obtusa rosea, 6—11 mm. longa, 0·5—1·25 mm. lata; staminodia ad stamina conice conferta appressa eaque leviter excedentia, mox superne recurva; filamenta ca. 3-seriata, dimidio inferiore pallido, superiore purpureo, interiora medio papillata, antheris pollineque albis; discus crenulatus; ovarii lobi erecti approximati, leviter obtuse compressi, sat conspicue tuberculati, tuberculis sublimpidis (non antea in genere notatis), demum ad 0·75 mm. elevati; stigmata 6, subulata, fere ad 4 mm. longa cum cauda ad 0·75 mm.; capsula matura senectissima tantum visa, inferne obconica, 3 mm. longa, 6 mm. diam., suturis vix compressis.

Cape Prov.: Namaqualand; Rooiberg, Richtersveld, Jan. 1961, *A. J. Middlemost.* N.B.G. 424/61. Fl. Jul. 1962.

Ruschia komkansica L. Bol. sp. nov.—"Compacta fruticosa (bushy). 60 cm. alta" (*Hall*); rami 4 visi, feri rigidi glabri, 17—23 cm. longa, ad 6 mm. diam., internodiis 1—2 cm. longis, copiose ramulosi; ramuli ultimi floriferi per longitudinem omnem ramuli secundarii vel tertii saepius producti, itaque ramus omnis pleniflorus, 2-foliati, cum flore 2·5—4 cm. longi; partes herbaceae velutinae ob papillas capillares minutissimas, cum aetate glabrescentes sed tamen subvelutinae; folia primaria adulta mox patentia, supra visa linearia plana, prope apicem non vel vix angustata, obtusa, lat. visa superne non angustata, apice rotundata, apiculo in medio posito, lateribus convexis, carina obscura, ad 2·5 cm. longa cum vagina 1·5 mm., ad 4 mm. lata, ad 5 mm. diam., inferiora mox decidua, juvenilia saepe sat acute carinata; flores 1—3-nati, meridiani, ad 2 cm. diam.; pedunculi superne leviter, vel cum aetate sat conspicue, ampliati inque receptaculum transeuntes, 1—2 cm. longi, infra medium laterales bracteati, bracteis saepius 5—7 mm. longis; receptaculum prope basim leviter constrictum, ad 2·5 mm. longum, ad 5 mm. diam.; sepala 5, e basi superne angustata, 4—5 mm. longa, basi 1·5—2·5 mm. lata; petala in flore expanso in fascicula 5, sepala tegentia, conspicue disposita, 2-seriata, inferne non, vel leviter, angustata, obtusa vel acuta, purpureo rosea, ad 8 mm. longa, 0·5—1 mm. lata; staminodia sat pauca, stamina aequantia vel exteriora breviora, cum filamentis inferne roseo purpurea, superne atro-purpurea; stamina ca. 4-seriata, conice conferta, deinde erecta, filamentis complanatis, extimis inferne obscure ciliate papillatis, interioribus medio papillatis, antheris pollineque albis; discus profunde crenulatus; ovarii lobi e disco erecti, approximati, obtuse compressi, apice rotundati, ad 1 mm. elevati; stigmata 5, anguste subulata, ad 3 mm. longa cum cauda 0·75 mm.; capsula infra obconica 5-angulata, 3 mm. longa, 5 mm., expansa 10 mm., diam., supra ad 2 mm. elevata, suturis valde compressis, valvis late patentibus, carinis inferne contiguis, deinde late divergentibus, aristatis, arista apicem valvae attingente, tuberculo conspicuo subspathulato; semina subpiriformia levissima brunnea, 1 mm. longa.

Cape Prov.: Namaqualand; Komkans, "occasional", Aug. 1962, *H. Hall* 2550. N.B.G. 727/62.

Ruschia obtusifolia L. Bol. sp. nov.—Planta erecta compacta glabra, 7 cm. alta, 10 cm. diam., caule apice 8 mm. diam.; rami ad 6 cm. longi, internodiis 5—15 mm. longis, ad 2 mm. diam.; ramuli floriferi 2—4-foliati; partes herbaceae leves vel novellae subvelutinae ob papillas noncapillaceas minutas, virides; folia adulta ascendentia, supra visa plana, apice rotundata, lat. visa superne non angustata, apice rotundata, lateribus convexis, dorso rotundata, 1—1·3 cm. longa cum vagina ad 1·5 mm., 3—4 mm. lata diametroque; flores solitarii meridiani, ad 1·6 cm. diam.; pedunculi superne ampliati, in receptaculum gradatim transeuntes, rubre purpurei, 8—10 mm. longi, parum infra medium bracteati, bracteis erectis, eos arte amplectentibus, lat. visis acutis, 5—6 mm. longis; receptaculum vix ad 3 mm. longum, ad 5 mm. diam.; sepala 5, obtusa, 4—4·5 mm. longa, basi 1·5—2 mm. lata; petala 3-seriata, breviora pauca, inferne vix angustata, saepissime acuta, purpureo rosea, 4—7 mm. longa, 0·25—0·5 mm., vel rarius ad 0·75 mm., lata; staminodia ad stamina conice conferta arte appressa eaque aequantia vel parum exedentia, cum filamentis inferne pallida, superne saturate rubre purpurea; filamenta 3—4-seriata, ad 3 mm. longa, interiora prope medium papillata, antheris pollineque albis; discus profunde denticulatus; ovarii lobi approximati subglobosi, 0·5 mm., vel demum ad 1 mm., elevati; stigmata 5, profunde posita, subulata, longe attenuata, alba, demum ad 2·5—3 mm. longa cum cauda 0·5 mm.

Cape Prov.: in dit. Vanrhynsdorp; Knechtsvlakte, Sout Rivier, "on rock in river-bed", Jul. 1962, *H. Hall* 2467. N.B.G. 610/62.

Ruschia koekenaapensis L. Bol. sp. nov.—**R. obtusifoliae** simillima, praecipue in forma mensuraque florum, sed differt foliis supra visis e parum supra basim superne angustatis, lat. visis leviter angustatis, acutis vel subacutis, lineis marginalibus carinaleque magis conspicuis; petalis roseis, interdum obtusis; stigmatibus anguste subulatis. Folia rarissime obscure recurvata, ad 5 mm. lata diametroque.

Cape Prov.: in dit. Vanrhynsdorp; "10 miles from Koekenaap, on road to Nuwerust," Jul. 1962, *H. Hall*, 2398. N.B.G. 543/62.

Ruschia truteri L. Bol. sp. nov.—Rami 6 visi, virgati glabri subcompressi, leviter alati, 11—19 cm. longi, internodiis pallide brunneis vel canescentibus, saepius 3—4 cm. longis, 2—3 mm. diam.; partes herbaceae virides vel novellae subglaucae; folia primaria adulta mox patentia, basi subdecurrentia, cicatrice delapsorum subtriangulare, supra plana, superne vix angustata, obtusa, lat. visa superne vix angustata, apice rotundata, lateribus leviter convexis, carinata, carina demum ad lineam reducta, rarissime obscure denticulata vel in novellis junioribusque 3—5 denticulata, ad 2 cm. longa cum vagina 0·5 mm., medio 3—4 mm. lata diametroque; flores solitarii; pedunculi teretes, 1—2 cm.

longi, prope medium bracteati, bracteis interdum conspicuis, 7—11 mm. longis cum vagina ad 2 mm.; receptaculum obconicum vel globose obconicum, 3—4 mm. longum, 6—7 mm. diam.; sepala 5, e medio superne angustata, obtusa breviterque subulata, omnia ± marginata, 5—6 mm., vel in flore altero 6—7 mm., longa, basi 2—4 mm. lata; petala non bene visa, 1-seriata ut videtur, inferne vix angustata, obtusa, purpureo rosea, 1·3 cm. longa, 1·25 mm. lata; staminodia perpauca, staminibus breviora; filamenta ca. 4-seriata, conice collecta, inferne pallida, superne purpureo rosea, ad 4 mm. longa, exteriora basi obscure papillata, interiora parum supra basim papillata, antheris pollineque albis; discus sat conspicuus, profunde crenatus; ovarii lobi e disco fere erecti, sat obtuse compressi, tuberculati, ad 2·5 mm. elevati; stigmata 5, gracilia, inter lobos profunde posita, ad 7 mm. longa; capsula non visa.

Cape Prov.: in dit. Somerset East; "on his farm Brakfontein, Jul. 1961, *J. Truter*". Fl. Veld Reserve, Worcester, Jul. 1962, *P. A. B. van Breda* 1711.

Ruschia foliosa L. Bol. sp. nov.—Erecta rigida glabra, dense foliata, 30 cm. alta, caule ca. 8 mm. diam.; rami primarii feri ca. ad 23 cm. longi, ad 5 mm. diam., internodiis 5—20 mm. longis; ramuli steriles saepius crebre 4—6-foliati, floriferi 2-foliati, saepe inferne cicatrices 2—4 foliorum delapsorum ferentes, 1·5—3·5 cm. longi; partes herbaceae levissimae politaeque (ut in **R. stricto**), sat pallide virides; folia diu fere erecta, matura valde compressa, supra visa plana linearia, e prope medium angustata acuta, 5—10 mm. lata, lat. visa superne ampliata, parum medium ad 1·5 cm., saepius 9—10 mm., diam., apice rotundata vel rotundo subtruncata, lateribus planis vel leviter convexis, carina acuta, 2·5—3·5 cm. longa cum vagina 2 mm.; flores sat sparsae, saepissime singuli, aliter 2—3-nati, feri subsessiles meridiani; pedunculi culti 7—13 mm. longi, basi bracteati, bracteis carinatis, lat. visis acutis, 2—3 mm., vel culti ad 5 mm., longi; receptaculum globose obconicum vel cultum subclavatum, 3—4 mm. longum, 5—7 mm. diam.; sepala 6, e basi superne angustata, acuta vel acuminata, omnia ± marginata, 4—5 mm., vel 5—6 mm., longi, basi 1·5—2 mm., vel ad 3 mm., lata; petala 2-seriata, e parum infra medium leviter angustata, obtusa rosea, 7—9 mm., vel in flore altero ad 1·1 cm., longa, ad 1·25 mm. lata; staminodia subnulla; stamina conice conferta, parum supra medium leviter constricta, filamentis 4—5-seriatis, albis, ad 5 mm. longis, exterioribus inferne ciliate papillatis, intimis prope medium papillatis, antheris pollineque albidis; discus crenulatus; ovarii lobi non compressi, leviter convexi, apice obtusi, nitentes, ad 1 mm. elevati; stigmata 6, gracillima, basi tantum levissime incrassata, ad 6 mm. longa; capsulae senectissimae tantum visae, infra breviter obconicae, 3 mm. longae, 6 mm., expansae 1·2 cm., diam., supra per 1·5 mm. elevatae, suturis compressis, carinis inferne contiguis, superne late divergentibus, aristatis, aristis apicem valvae attingentibus, valvis interdum angustissime alatis, tuberculo minuto, in fructu immaturo autem parum majore.

South-West Africa: Lorelei Copper Mine, Mart. 1960, *H. Hall* 1927. N.B.G. 233/60. Fl. Jan. 1961.

The placing of this species in the genus **Ruschia** is unsatisfactory on account of the occasional presence of a valve-wing in the old capsules seen. When these are procurable in perfect condition the matter should receive further consideration.

Leipoldtia littlewoodii L. Bol. sp. nov.—"Planta 22 cm. alta, 53 cm. diam., caule basi 3 cm. diam." (*Littlewood*) ramus floriferus visus, 16 cm. longus, internodiis 1—2 cm. longis, ad 3 mm. diam.; ramuli primarii ad 12 cm. longi; folia primaria ascendentia, mox fere patentia, supra visa superne convexula, acuta, lat. visa obtusa vel oblique subtruncata, lateribus convexis, carina saepius ad lineam reducta, 1—1·3 cm. longa cum vagina 2 mm. longa, ad 5 mm. lata diametroque; flores 2-ternati vel fortasse cum aetate irregulariter 3-ternati, 1·7—2 cm. diam.; pedunculi 3—4·5 cm. longi, cum aetate superne decurvati, laterales prope basim bracteati, bracteis ad 1 cm. longis; receptaculum semiglobosum, 2—3 mm. longum, ad 5 mm. diam.; sepala 5, subaequilonga, a medio superne angustata, obtusa vel acuta, omnia ± marginata, ad 5 mm. longa, basi 2—3 mm. lata; petala 2-seriata, inferne leviter angustata inconspicueque vittata, obtusa vel subacuta, purpureo rosea, 7—9 mm. longa, 1—1·75 mm. lata; staminodia ad stamina conice conferta appressa eaque leviter excedentia, demum valde recurvata, basi rosea, superne alba; filamenta ca. 4-seriata, inferne rosea, superne alba, ad 4 mm. longa, exteriora inferne ciliate papillata, intima prope medium papillata, antheris pollineque albidis; discus profunde divisus; ovarium circa marginem planum, deinde lobis erectis approximatis subconvexis obtusis, prope medium leviter constrictis, ad 1·5 mm., vel demum ad 2 mm., elevatis; stigmata 10, anguste subulata, 3 mm., vel demum ad 5 mm., longa cum cauda 1 mm.

South-West Africa; "7 miles S. of Witputz", Oct. 1961, *R. C. Littlewood*. Karoo Garden 861/61. Fl. Jul.—Aug. 1962.

Astridia hillii L. Bol. sp. nov.—Planta 1 visa, compacta, 18 cm. alta; rami ad 13 cm. longi, internodiis 5—12 mm. longis; ramuli ultimi steriles crebre 4—6-foliati, internodiis in vaginis inclusis, floriferi crebre 2—4-foliati; partes herbaceae velutinae, glauce virides; folia senecta indurata diuque persistentia, hornotina adulta basi decurrentia per 5—9 mm., mox patentia, supra visa plana, acuta, linearia, lanceolata, oblonge lanceolata, vel brevissima late subovata et 1·5 cm. longa et medio 1 cm. lata, cetera 2·7 cm. longa, 8—10 mm. lata vel ad 3 cm. longa cum vagina vera 3 mm., 1·2 cm. lata diametroque; flores subsessiles; bracteae apice lat. visae oblique acutae vel subtruncatae, margine non excavato, 7 mm., vel demum ad 10 mm., longae; receptaculum 4 mm. longum, ad 7 mm. diam.; sepala obtusa, interiora carinata, apice breviter subulata, 5 mm., vel interiora ad 7 mm., longa, basi 3—6 mm. lata; petala exteriora 3-seriata, e supra medium inferne conspicue angustata, saepius obtusa, salmoneo rosea ("old rose"), 1·4—2 cm. longa, 1—2 mm. lata, interiora linearia in staminodia ad 1 cm. longa transeuntia, ad 1·3 cm. longa; filamenta ca. 4-seriata, inferne pallida, superne rubre aurantiaca, ad 9 mm. longa, antheris pollineque aureis; ovarii lobi ad 1 mm. elevati; stigmata 6 mm. longa; capsula infra obconica, 4 mm. longa, 1·2 cm., expansa 2·2 cm., diam., supra per 5 mm. elevata; semina subpiriformia, asperula, basi tantum minute echinata, ad 1·5 mm. longa.

Cape Prov.: Namaqualand; Grootderm, Aug. 1956, *L. J. Hill.* Bolus Herb. 27253. Fl. Jul. 1962.

Trichodiadema littlewoodii L. Bol. sp. nov.—Planta 1 visa, 19 cm. alta; radix tuberosa, tuber primum 6 cm. longum, ad 2·5 cm. diam., e basi tubera secundaria 16, ad 9 cm. longa, ad 2·2 cm. diam. emittens; rami primarii ca. 11, ex apice tuberis primi crebre orientes, cum floribus ad 19 cm. longi, virgati, internodiis 1—3 cm. longis, 1—3 mm. diam.; folia ascendentia vel erecta, fere teretia, supra inferne complanata, lat. visa apice tantum leviter angustata, adulta apice saepius parce barbata, papillis marginalibus basim versus tantum setiferis, aliter omnibus esetiferis, 1—2·7 cm. longa, 5—3 mm. diam., vagina 1 mm. longa; flores in sole pleno a 2 horis ad 5 horas expansi; pedunculi apicem versus leviter ampliata, papillis inconspicue setiferis, 1—2 cm. longi; receptaculum semiglobosum vel late obconicum, papillis esetiferis, 4 mm. longum, ad 6 mm. diam.; sepala 5, in flore maximo viso 4—6 mm. longa, basi 2·5—4 mm. lata, extima obtusa, intima acuta; petala 4-seriata, pallide rosea, exteriora inferne non, vel leviter, angustata, saepissime obtusa, ad 8 mm. longa, 1—1·5 mm. lata, intima acuta, in staminodia, stamina bene excedentia, transeuntia; filamenta ca. 4-seriata, alba, ad 4 mm. longa, intima prope medium papillata, antheris pollineque pallide luteis; glandulae distantes; ovarium supra leviter concavum, dimidio interiore lobato, lobis erectis distantibus, obtuse compressis, altitudinem glandularum attingentibus vel demum parum ultra; stigmata 5, subulata, cum cauda 0·75 mm. longa ad 2·5 mm. longa; capsula infra obconica, 5-nervata, nervis angulos obscuros formantibus, ad 5 mm. longa, supra ad 2 mm. elevata, suturis acute compressis, marginibus ringentibus, 7 mm., expansa 1·3 cm., diam.

South-West Africa; Grabwasser, "13 miles W. of Grunau", Maio 1961, *R. C. Littlewood.* Karoo Garden 267/61. Typus. Fl. Mart. 1962, "60 miles N. of Aus", Mart. 1960, *H. Hall.* N.B.G. 276/60. Fl. Mart. 1962.

FORMA alba. Petala omnia alba. Karoo Garden 267/61.

Delosperma papillatum (L. Bol.) L. Bol. comb. nov.—*Drosanthemum papillatum* L. Bol., Mesemb. II: 23 (Dec. 1928).

Conophytum senarium L. Bol. in Journ. S.A. Bot. 27: 60 (Jan. 1961) = **Conophytum karamoepense** L. Bol., Mesemb. III: 90 (Aug. 1937). NOTE: the correct spelling of this place-name is Haramoep.

Anisocalyx vaginatus (L. Bol.) L. Bol. comb. nov.—*Drosanthemum vaginatum* L. Bol., Mesemb. II: 138 (Nov. 1929); *Anisocalyx salarius* L. Bol., Mesemb. III: 386 (Apr. 1958).

Note.—The type specimens of all new species decribed in this paper are in the Bolus Herbarium, University of Cape Town, Rondebosch.

(*To be continued.*)

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